



PHD

Goal Content in Exercise: A Self-Determination Theory Perspective

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**GOAL CONTENT IN EXERCISE:
A SELF-DETERMINATION THEORY PERSPECTIVE**

Simon James Sebire

A thesis submitted for the degree of Doctor of Philosophy

University of Bath
School for Health

March 2009

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List of Papers

The investigations carried out as part of the present PhD programme of research resulted in the following publications/submissions:

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Sebire, S. J., Standage, M., Gillison, F. B., & Vansteenkiste, M. (Manuscript in preparation). "Coveting thy neighbour's legs": Qualitative analysis of the experiences of exercisers pursuing relative intrinsic and extrinsic goals.

Sebire, S. J., Standage, M., & Vansteenkiste, M. (Manuscript in preparation). Predicting objectively assessed exercise behaviour from the content and regulation of exercise goals: Evidence for a mediational model.

Abstract

The purpose of the present thesis was to explore the cognitive, affective and behavioural correlates of adults' exercise goals using the *goal content* perspective forwarded in Self-determination Theory (SDT; Deci & Ryan, 2000). In Study 1, to facilitate theoretically consistent measurement of exercise goal content, the Goal Content for Exercise Questionnaire (GCEQ) was developed and validated in multiple adult samples ($N = 1306$). In Study 2, analysis of cross-sectional data from 410 adults showed that relative intrinsic goal content (assessed by the GCEQ) predicted variance in adaptive cognitive, affective and behavioural aspects of exercise. Commensurate the hypotheses of SDT, the effect of goal content on cognitive and affective (but not behavioural) variables remained significant above and beyond exercise behavioural regulation. The cognitive and affective effects of goal content were shown to be partially mediated by psychological need satisfaction. In Study 3, qualitative analysis of exercisers ($N = 11$) experiences of pursuing relative intrinsic/extrinsic goals revealed themes that advance the understanding of the mechanisms underlying the findings of Study 2. Extending the findings of Study 2, using a prospective design and objective behavioural assessment, in Study 4 ($N = 101$) a motivational sequence from goal content to engagement in health-enhancing bouts of exercise behaviour via behavioural regulation was observed. Collectively, the four studies provide a comprehensive analysis of exercise goal content from an SDT perspective. The findings highlight the utility of the goal content construct in understanding motivation for exercise and provide a foundation for theoretically aligned future research.

CHAPTER 1

General Introduction

General Introduction

1.1 Introduction

The purpose of this chapter is to introduce the conceptual and theoretical underpinnings that inform the research objectives of the four studies presented in this thesis. Firstly, as the broad focus of this research is human motivation, the concept of motivation will be introduced and Self-Determination Theory (SDT; Deci & Ryan, 1985, 2000), the theoretical framework which forms a cornerstone of the present thesis, will be discussed. In particular, a comprehensive overview of the *goal content* facet of SDT will be presented as this is the specific aspect of motivation that guided this research. In the present thesis, motivation is studied within the context of physical exercise. As such, research findings pertaining to the benefits of an active lifestyle, exercise and physical fitness will be highlighted and discussed alongside data concerning current trends in physical activity participation. These findings provide justification for the study of exercise motivation.

The four empirical chapters (i.e., Chapters 3, 4, 5 and 6) are presented as individual empirical papers. As such, the Introduction sections of these chapters present a review of evidence pertinent to the specific research question posed. Therefore to avoid repetition this General Introduction takes a broader approach and builds the foundations on which the empirical chapters are based.

1.2 Motivation and Goals

Motivation concerns the energisation and direction of behaviour (Deci & Ryan, 1985). Although the study of motivation has been a central tenet of mainstream psychology since the early 19th Century (Deci & Ryan, 1985), the study of exercise participation motivation has a shorter history, commencing in the 1970s (Frederick-Racascino, 2002; Ryan & Deci, 2007) and being largely descriptive in the 1980s (Horn, 2008). More recently, research concerning exercise motivation has often been linked with and guided by theoretical perspectives, a practice which is encouraged in exercise and health research (Brawley, 1993).

The social cognitive approach is perhaps the most widely used overarching framework employed in the study of sport and exercise motivation (Roberts, 2001). From this perspective humans are conceptualised as *active* rather than *reactive*

organisms. As such, these approaches have advanced beyond psychoanalytic and empirical traditions in which humans are viewed as purely drive-based organisms (Freud, 1943; Hull, 1943), prompted to action in order to establish equilibrium via the satisfaction of physiological drives (Deci & Ryan, 1985). Social cognitive theories facilitate examination of the associations between individual and contextual-environment motivational factors, their interaction and effects on cognitive, affective and behavioural outcomes (Roberts, 2001).

Another common starting point for many psychological frameworks, (including social cognitive theories of motivation utilised in the sport and exercise domain) is the goals that guide individuals' behaviour (Austin & Vancouver, 1996). In line with the conceptualisation of motivation as a direction of behaviour (Deci & Ryan, 1985), a goal is broadly defined in the Oxford English Dictionary (2005) as "an aim or desired outcome." Although simplistic, this definition is aligned with more detailed definitions of goals from the psychology literature. For example, Elliot and Friedman (2007) define a goal as "a cognitive representation of a possible state or outcome that an individual seeks to attain" (p. 98). Similarly, goals are defined by Austin and Vancouver (1996) as "internal representations of desired states, where states are broadly construed as outcomes, events or processes" (p. 338). Despite goals being a commonality among many social cognitive goal-based theories utilised in the study of sport and exercise motivation, within these theories different characteristics of goals are examined. To illustrate, goals are categorised according to their content (i.e., intrinsic vs. extrinsic) (Deci & Ryan, 2000) or their behavioural regulation (i.e., autonomous vs. controlled) (Deci & Ryan, 1991; Deci & Ryan, 2000) within SDT, according to their achievement focus (i.e., task vs. ego) within achievement goal theory (Nicholls, 1989) or based on their end-state valence (i.e., approach vs. avoidance) within the hierarchical model of approach-avoidance motivation (Elliot & Church, 1997; Elliot & Friedman, 2007).

Within the present thesis, motivation for exercise is studied using the definitional conventions and theoretical perspectives of the *goal content* facet forwarded within SDT (Deci & Ryan, 1985; 1991; 2000). SDT is a framework of human motivation that lends itself to the study of exercise goals (see Hagger & Chatzisarantis, 2007). Before discussing the merits of SDT, the following section provides an overview of the evidence supporting the study of exercise motivation and exercise goals.

1.3 A Case for Studying Exercise Motivation in Adults

The belief that physical activity contributes to positive health dates back to ancient times (MacAuley, 1994). Such beliefs appear well founded given the burgeoning contemporary scientific evidence pointing towards a consensus that physical activity and/or physical fitness are negatively related to many chronic diseases and associated with a number of adaptive physiological and psychological consequences (Department of Health, 2004).

Physical activity encompasses all movement produced by skeletal muscles that confers energy expenditure above rest (Caspersen, Powell, & Christenson, 1985). A number of categories of physical activity subsume this over-arching definition, such as activity performed in occupational, household, transport and leisure-time contexts. Probably most appropriately (although not exclusively) nested within leisure-time physical activity, Caspersen et al. (1985) define *exercise* as a sub-component of physical activity that is more “planned, structured, repetitive, and purposive in the sense that improvement or maintenance of one or more components of physical fitness is an objective” (p.128).

Interestingly, in the context of the present thesis, which examines individuals’ exercise goals, while the first part of Caspersen et al.’s definition (i.e., “planned, structured, repetitive, and purposive”) seems common to all exercise behaviour and is the definition of exercise operationalised herein, the second part of their definition (i.e., “...improvement or maintenance of one or more components of physical fitness is an objective”) speaks more to issues concerning the underlying motivation for exercise, suggesting that the exclusive goal of exercise is to maintain or improve one’s fitness. Given the four empirical studies presented in this thesis, it is clear that physical fitness/health is only one out of numerous goals that individuals may pursue during structured, planned and purposeful exercise. Indeed, if physical fitness was the only goal that exercisers pursued, the central questions concerning the effect of different exercise-based goal content posed in this thesis would not need to be addressed. However, Caspersen et al.’s definition appropriately delineates *exercise* from *physical activities of daily living* for the purposes of the present thesis and as such forwards exercise as a behavioural enactment that is sufficiently purposeful to require cognitive processes (Edmunds, Ntoumanis, & Duda, 2006b) pertaining to the psychology of motivation.

The World Health Organisation's (WHO) Global Strategy on Diet, Physical Activity and Health emphasises the importance ascribed to active lifestyles in combating the growing global burden of chronic diseases (World Health Organization, 2004). Specifically, physical activity and fitness is associated with reduced all-cause mortality and decreased risk of obesity/overweight, coronary heart disease, stroke incidence, hypertension, diabetes mellitus and some site-specific (e.g., colon & breast) cancers (see Hardman & Stensel, 2003 for a review). Physical activity also has positive effects on skeletal health (Hardman & Stensel, 2003), is positively associated with psychological well-being and favourable self-perceptions and can relieve the symptoms of depression and anxiety (Biddle & Mutrie, 2001; Fox, 1999).

Given the health benefits associated with being physically active and an estimated cost of physical inactivity to the British economy of £8.2 billion per annum, the British Government recommends that adults perform 30 minutes of moderate intensity aerobic physical activity (i.e., 3.5 to 7.0 kcal·min⁻¹, or generally equivalent to a brisk walk) on at least five days of the week (Department of Health, 2004). This volume of activity can be performed in a single bout or accumulated throughout a day in shorter 10-minute bouts of activity (Department of Health, 2004). Recent recommendations specify that as an alternative to performing 30 minutes of moderate intensity physical activity on five days of the week, adults could perform three weekly 20-minute bouts of vigorous intensity physical activity (i.e., ≥ 7.0 kcal·min⁻¹) or a combination of the two time- and intensity-based recommendations (Haskell et al., 2007).

In 2005, the Government set a goal of 70% of the English population achieving a minimum of five 30-minute bouts of moderate intensity physical activity per week by 2020 (Department of Health, 2005). The most recent statistics from the Health Survey for England (The Information Centre, 2008) suggest that 34% of adults (Males = 40%, Females = 28%) report meeting the Government's physical activity recommendations, clearly highlighting the magnitude of the public health challenge ahead. Compounding this challenge, larger volumes of activity are recommended for people wishing to prevent weight-gain in the absence of reduced energy intake (45-60 minutes of moderate activity at least five times per week), and for those who have lost weight and want to maintain a healthy weight (60-90 minutes of moderate activity at least five times per week) (Department of Health, 2004). These recommendations are particularly pertinent given contemporary rises in overweight and obesity (Department

of Health, 2004). Finally, Haskell et al. (2007) have recently suggested that the recommended volumes of physical activity should be performed in addition to individuals' routine light-intensity activities of daily living (e.g., shopping, or walking to the office from the car park).

In light of these recommendations, purposeful exercise may represent an effective means of achieving levels of physical activity likely to foster good health in adults. The body of evidence supporting the health benefits of active lifestyles and the discrepancy between current and target levels of physical activity provide additional justification for conducting research pertaining to the motivation of exercise behaviours in adults.

Although exercise participation is predicted to yield many benefits for physical and psychological health, the literature presented thus far has only dealt with the issue of the quantity, rather than the quality of behavioural engagement. While increasing participation rates (i.e., increasing the quantity of exercise behaviour) is vitally important for the nation's health, this may not be adaptive for individuals in the long-term if their participation is fraught with discouraging experiences and maladaptive practices (i.e., a poor exercise quality). SDT represents a framework that can be used to study both the quantity and quality of behavioural engagement by focusing on the nature of people's goals and motivational regulations. The following section introduces the central tenets of SDT, the theoretical framework which guides the study of motivation in this thesis.

1.4 Self-determination Theory

1.4.1 Theoretical Overview

Self-determination theory (Deci & Ryan, 1985; 1991; 2000) is an empirically grounded framework concerned with understanding optimal motivation for goal directed behaviour and adaptive human functioning. Due to the phenomenological nature of its fundamental components, SDT has been applied to the study of goal directed behaviour in numerous contexts such as education, (un)employment, parenting, healthcare, sports and exercise. Recently, a self-determination theory model of health behaviour change has been forwarded (Figure 1.1) highlighting the links between SDT and issues pertaining to the improvement of health (Ryan, Patrick, Deci, & Williams, 2008). Importantly for the present thesis, a component part of this model of health behaviour change is the explicit content of people's goals or aspirations (i.e., goal content). Hypotheses are forwarded in SDT regarding the effect of people's goals on cognitive, affective and behavioural outcomes and the processes by which such effects might manifest.

SDT is grounded in organismic principles. To this end, the human self is viewed as bearing an innate propensity to be self-motivated, pursue growth and proactively seek development and integrative functioning to attain both more holistic and unified self-regulation and integration of oneself with others (Deci & Ryan, 1991; 2000; Ryan & Deci, 2002). SDT is also built on dialectical inferences that human organismic tendencies are optimally fulfilled to the extent that dialectical interactions within one's social-context are facilitative of the satisfaction of innate psychological needs of autonomy, competence and relatedness (Deci & Ryan, 1991; 2000; Ryan & Deci, 2002).

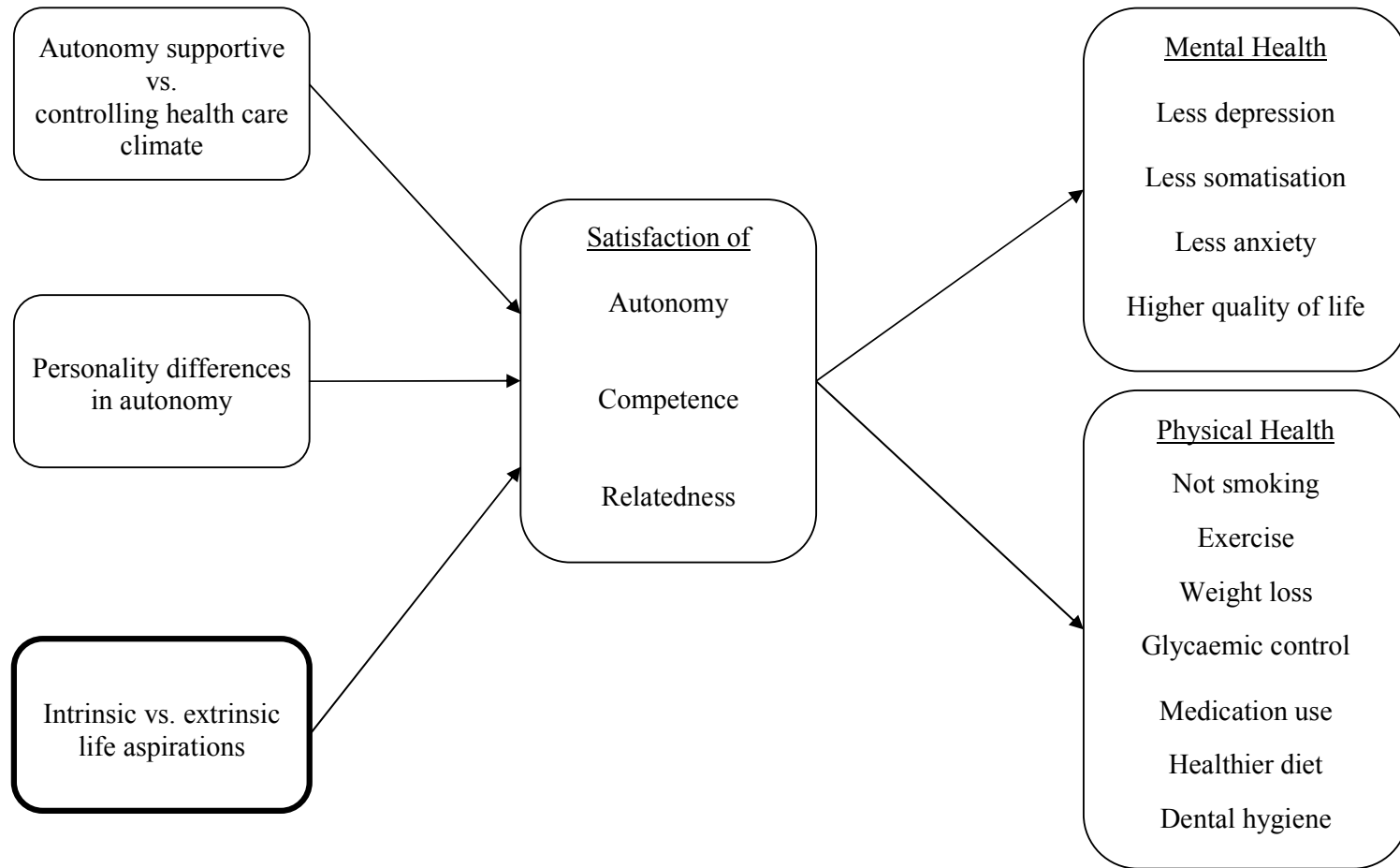


Figure 1.1 The self-determination theory model of health behaviour change (Ryan, Patrick et al., 2008).

Historically, the concept of innate needs can be traced to the propositions of drive theorists such as Hull (1943) who asserted that behaviour could be accounted for by the action taken to reduce innate physiological drives stimulated by a state of disequilibrium. However, despite similarity regarding the innate nature of needs, within SDT emphasis is placed on the *psychological* needs for autonomy, competence and relatedness. These needs are viewed as essential nutriment which when satisfied promote optimal psychological (e.g., growth, development and well-being) and behavioural (e.g., performance and persistence) functioning. When the basic needs are thwarted or unsatisfied it is hypothesised that adaptive psychological and behavioural functioning will be hampered (Deci & Ryan, 2000). The concept of psychological needs within SDT has been differentiated from psychological needs in alternative psychological theories (Deci & Ryan, 2000). Specifically, similar to the contentions of Maslow (1943), psychological needs within SDT are proposed to be innate to all humans rather than acquired (i.e., learned) through experiences, as work following the personality theories in the Murray tradition (Murray, 1938) would contend. According to Deci and Ryan (2000) investigations adopting this perspective embrace a very broad definition of needs which encapsulates anything that drives action. As such, in this tradition, the concept of psychological needs is not based on the postulation that psychological need satisfaction leads to optimal functioning, as needs such as greed (which may move someone to act) are postulated. Further, personality theories base analysis of the effectiveness of psychological needs on outcomes by considering their strength (i.e., importance to the person based on their learning of the needs) (Deci & Ryan, 2000). In contrast, in SDT, needs are presumed to be innate, not learned therefore the concept of psychological need satisfaction facilitating optimal functioning transcends difference cultures, genders and ages (Deci & Vansteenkiste, 2004) rather than focusing on differences in strength.

Autonomy concerns the need to feel agentic (or the “origin” rather than the “pawn”) in one's actions and to experience a sense of choice and psychological freedom (De Charms, 1968; Deci & Ryan, 2000). Competence refers to the need to experience environmental effectance (Deci & Ryan, 2000; White, 1959). Finally, relatedness refers to the need to feel mutual connectedness with others (Baumeister & Leary, 1995; Deci & Ryan, 2000). These psychological needs are differentiated from learned motives, goals or wants and are considered universal and innate regardless of culture, age or gender (Ryan & Deci, 2000; Sheldon, Elliot, Kim, &

Kasser, 2001). Previous research has empirically supported these contentions across diverse cultures (e.g., Deci et al., 2001) and gender (e.g., Ryan, La Guardia, Solky-Butzel, Chirkov, & Kim, 2005). Further, studies of children (Standage, Duda, & Ntoumanis, 2005) and adults (Vansteenkiste, Neyrinck et al., 2007) have shown adaptive correlates of psychological need satisfaction. Finally, it is forwarded that all three needs require satisfaction to optimise one's innate organismic tendencies; the satisfaction of just one or two needs is insufficient (Deci & Ryan, 1991).

The psychological needs forwarded within SDT are central to the differentiation between goals with different content (Deci & Ryan, 2000; Kasser, 2002; Kasser & Ryan, 1996; Vansteenkiste, Lens, & Deci, 2006) which forms a cornerstone of the present thesis. The basic needs are also a unifying construct between the four sub-theories that comprise SDT, which are consistent in their organismic and dialectic philosophies (Deci & Vansteenkiste, 2004). The four sub-theories (see Ryan & Deci, 2002 for a comprehensive review) are: (a) Cognitive Evaluation Theory (Deci, 1975), (b) Organismic Integration Theory (OIT; Deci & Ryan, 1985), (c) Causality Orientations Theory (Deci & Ryan, 1985) and (d) Basic Needs Theory (BNT; Ryan & Deci, 2002). The investigations reported in Chapters 3 to 6 are based largely on the SDT perspective of goal content. Both OIT and BNT are of central importance as they provide many of the foundations of the goal content perspective and a number of points of theoretical integration and differentiation which are crucial to the present empirical investigations. As such, before discussing goal content, the theoretical tenets of OIT and BNT are outlined.

1.4.2 Organismic Integration Theory: The “Why” of Motivation

Organismic integration theory addresses the *quality* of people's motivation. Within OIT it is asserted that adaptive cognitive, affective and behavioural consequences will result from goal pursuit regulated by more self-determined forms of motivation. As such, three overarching forms of motivation are specified; intrinsic motivation, extrinsic motivation and amotivation. Intrinsic motivation represents the free enactment of a behaviour out of interest in the activity and for the satisfaction experienced which is inherent in the activity itself (Deci & Ryan, 1991; Deci & Ryan, 2000). While intrinsically motivated behaviours are enacted in the absence of separable external rewards, such behaviours are based in the “rewarding consequences” (Deci & Ryan, 1991, p. 241) of innate psychological need satisfaction. In contrast, extrinsic motivation is broadly defined as engaging in an

activity for some separable consequence (Deci & Ryan, 2000). The concept of extrinsic motivation is particularly relevant within the context of exercise as while there may be occasions when exercise is interesting, optimally challenging and inherently satisfying, it is clear that exercise does not exude these properties for all (Ryan, Patrick et al., 2008). For such individuals, exercise is performed to confer some consequence separable from engagement in the activity itself whether it is personally valued or imposed by an external agent (e.g., a doctor).

Commensurate with the organismic foundations of SDT, Deci and Ryan use the term *organismic integration* to describe the human tendency to actively seek alignment of externally offered elements with a more coherent sense of self (Deci & Ryan, 1991). The process through which a human achieves greater self-regulation is often termed *internalisation* and is an important part of OIT. To this end, extrinsic motivation is forwarded as a multi- rather than uni-dimensional construct. That is, while always entailing motivation towards an activity for some separable consequence, extrinsic motivation is not uniformly “external” to the person but varies in the degree to which it is self-determined (or autonomous) reflecting the level of integration or internalisation. Given the differentiation of extrinsic motivational types, self-determination theorists have moved away from using *intrinsic* and *extrinsic* terms to describe groups of motivational regulations, and towards the broad terminology of *autonomous* or *controlled* regulations reflecting the degree to which the motivation is self-determined.

Extrinsic motivation is partitioned into four behavioural regulations, ordered along a continuum of self-determination (Figure 1.2). Ranging from least to most self-determined these are: external regulation, introjected regulation, identified regulation and integrated regulation. The regulations are hypothesised to be associated in a simplex-like pattern (Guttman, 1954) whereby regulations more proximal to one another on the continuum (e.g., external regulation & introjected regulation) are more highly correlated than regulations more distal on the continuum (e.g., external regulation & integrated regulation).

External regulation is the least self-determined form of extrinsic motivation and represents motivation whereby behaviour is controlled by an external contingency such as a reward or the avoidance of punishment. An individual motivated to begin a new exercise regime to comply with the demands of a pressuring partner or for fear of negative consequences following non-participation

(e.g., criticism from the partner) would be considered to be acting out of external regulation. Within introjected regulation, external regulations are partially internalised and as such, emanate from within the individual to control behaviour via self-imposed sanctions. Introjection is based on self-esteem related contingencies, pride and ego-enhancements and avoidance of guilt or shame (Deci & Ryan, 2000). An individual exercising in order to avoid feelings of guilt for leading a sedentary lifestyle would be motivated by introjection. Introjected regulation can be characterised by approach (e.g., ego-enhancements) or avoidance (e.g., avoidance of guilt) motivational components. Such intricacies of introjection may account for the inconsistent findings pertaining to both adaptive and maladaptive short term effects of introjected regulation in education, sporting and exercise contexts (see page 17). External and introjected regulations are controlling rather than autonomous forms of motivation. Identified regulation reflects a more complete internalisation and recognition of the inherent value of a given behaviour. In contrast to introjected regulation, in identified regulation behaviour is more self-endorsed (Deci & Ryan, 2000). In the context of exercise, an individual who engages in the exercise because they value the resultant effects (e.g., enhanced health or a slender figure) would be identified in their motivation. The most self-determined form of extrinsic motivation is integrated regulation. As with identified regulation the individual identifies with the value of the behaviour but in addition aligns this value with other aspects of their identity and values. An individual who exercises as part of a healthy lifestyle and aligns exercise with their other valued life-goals would exercise out of integrated regulation. Both identified and integrated regulations are relatively autonomous forms of extrinsic motivation.

Having introduced the concepts of integration, it is important to note that intrinsic motivation is not malleable and does not require internalisation as it is the prototypic behavioural regulation proposed to be an innate manifestation of the human integrative process (Deci & Ryan, 1985, 2000). Finally, the self-determination continuum is completed with amotivation which represents “non-regulation” from the SDT perspective as it pertains to lack of intention to act. As such, amotivation concerns the amount or quantity of motivation rather than a qualitatively different form of behavioural regulation. A person who is amotivated towards exercise would either not exercise at all, or engage in exercise in a passive and disorganised manner (Ryan & Deci, 2002). According to the SDT perspective,

the extent to which individuals integrate or internalise external regulations depends on the level of support offered by one's environment for the needs for autonomy, competence and relatedness.

Within OIT, the position of the different motivational regulations along the self-determination continuum is useful when hypothesising associations between exercise behavioural regulations and outcome variables (Deci & Ryan, 1991). Two strands of evidence pertain to OIT in the exercise context; (a) the relationship between the different exercise behavioural regulations and cognitive, affective and behavioural outcomes; and (b) whether exercise-based need satisfaction facilitates the integrative process and subsequently underpins more autonomous behavioural regulations.

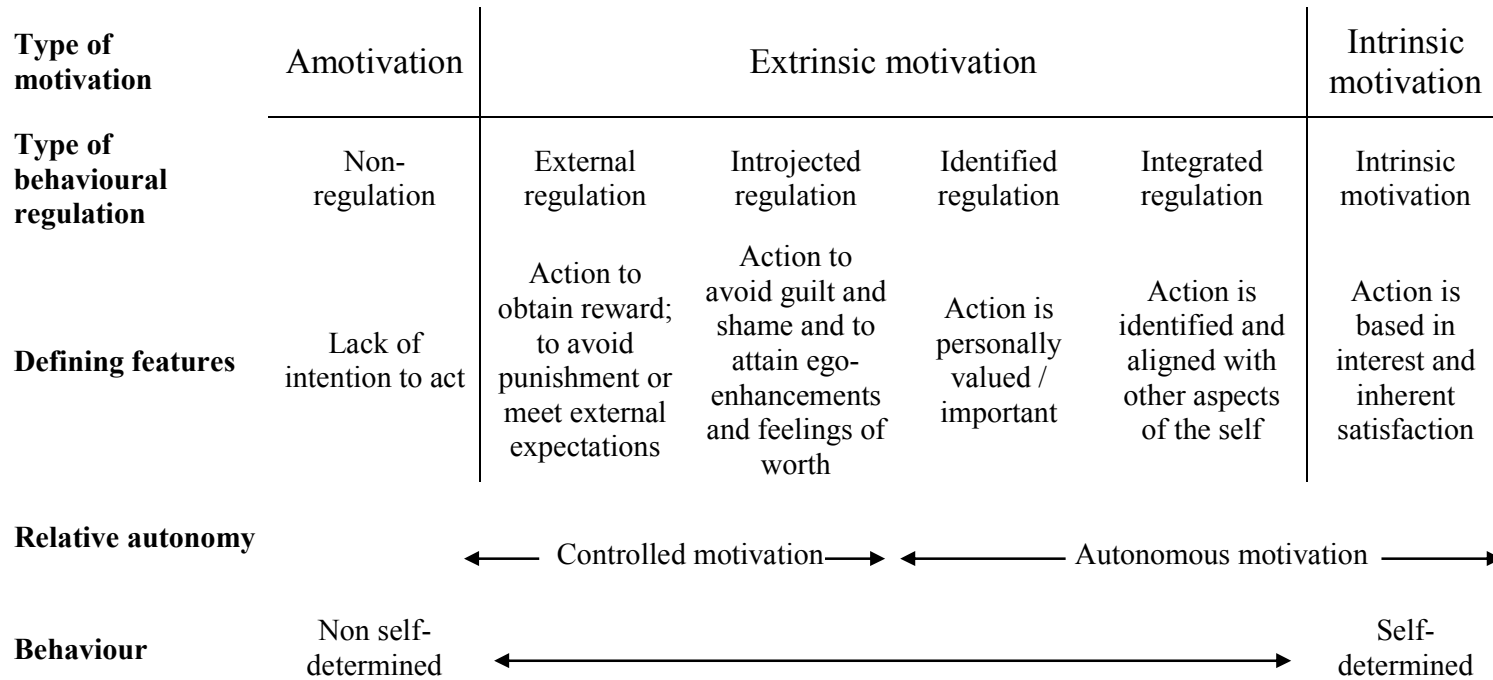


Figure 1.2 The self-determination continuum of motivation, adapted from Ryan and Deci (2002).

Numerous studies in health (see Sheldon, Williams, & Joiner, 2003), physical education, exercise, and sport (see Hagger & Chatzisarantis, 2007) domains have contributed to a thorough examination of SDT-derived hypotheses that autonomous relative to controlling forms of behavioural regulation should yield more adaptive cognitive, affective and behavioural outcomes. With regards to cognitive outcomes, investigations within PE settings have found autonomous motivation towards PE to positively predict concentration (Ntoumanis, 2001; Standage et al., 2005) and negatively predict boredom (Ntoumanis, 2001), while controlling motivation (e.g., external regulation) to positively predict boredom (Ntoumanis, 2001). Studying a sample of university students, Hagger, Chatzisarantis, and Harris (2006) identified that a weighted composite measure of relative autonomous motivation for exercise positively predicted adaptive exercise attitudes and individuals' perceived behavioural control of exercise which both subsequently positively predicted self-reported exercise behaviour via exercise intentions. Research in adult populations has also shown higher scores on intrinsic and identified motivation to discriminate between female participants of an exercise class reporting higher and lower physical self-worth respectively (Wilson & Rodgers, 2002). These findings were corroborated in a sample of male and female exercisers recruited from British health clubs by Thøgersen-Ntoumani and Ntoumanis (2006). In this study it was also found that social physique anxiety was positively associated with introjected regulation but was negatively associated with intrinsic motivation.

Relationships between exercise behavioural regulations and affect have also been investigated. Evidence pertaining to these relationships in adult non-athlete samples is currently lacking, however findings from research conducted in the school PE context and investigations using athlete samples largely corroborate results of research outside of the exercise domain. This research documents positive associations between autonomous motivation in general life and adaptive well-being outcomes (Ryan, Huta, & Deci, 2008). In the physical domain, more autonomous forms of motivation for PE have been shown to negatively predict pupils' negative affect (Ntoumanis, 2005; Standage et al., 2005) and positively predict positive affect, with similar results being observed for self-reported unhappiness during a PE lesson (Standage et al., 2005). In a sample of adult athletes of varied competitive level, Smith, Ntoumanis, and Duda (2007) showed that a latent variable representing life-level well-being (i.e., a composite of scores on self-reported indices of life-level

positive and negative affect and life satisfaction) was directly negatively predicted by the degree of controlled motivation with which the athletes regulated their current sport-based goals. Collectively these findings support the contention that contextual motivation (e.g., motivation towards a context such as PE, exercise or sport) may have adaptive or deleterious effects on affect and psychological well-being at both the contextual and global (e.g., general disposition) levels of generality (Vallerand, 1997) depending on the degree to which an individual regulates their goal pursuits with self-determined or controlled processes.

Ryan and Deci (2007) contend that exercise behaviour will be maintained by those who regulate their exercise activities through autonomous processes. Many SDT-based studies have been conducted to investigate this hypothesis, employing a range of indices of exercise behaviour. In line with research concerning cognitive and affective outcomes, this research has generally shown that more autonomous relative to controlled behavioural regulations predict adaptive behavioural outcomes. Specifically, a number of investigations have found that individuals who report to be in the more advanced stages of change (i.e., action and maintenance stages) as defined within the transtheoretical model (Prochaska, Diclemente, & Norcross, 1992) display greater autonomous motivation for exercise (see Fortier & Kowal, 2007 for a review). In addition, studies have largely identified positive associations between autonomous behavioural regulations and self-rated effort (Ntoumanis, 2001) and intention to engage in challenging tasks (Standage et al., 2005) within PE, self-rated exercise effort in university students (Wilson, Rodgers, Fraser, & Murray, 2004), children's intentions to exercise/be physically active within PE settings (Ntoumanis, 2001, 2005) and adults' exercise intentions (Hagger et al., 2006; Wilson & Rodgers, 2004; Wilson et al., 2004), lower self-reported frequency of exercise relapse (Thøgersen-Ntoumani & Ntoumanis, 2006) and self-reported exercise behaviour (Edmunds et al., 2006b; Wilson, Rodgers, Blanchard, & Gessell, 2003; Wilson et al., 2004).

The aforementioned studies are similar in that they each employed subjective assessments of exercise behaviour (or a variant or proxy thereof) which have been shown to be limited in their ability to accurately quantify actual behaviour (see Chapter 2 for an overview). In addressing this limitation, researchers have attempted to employ more objective assessments of exercise in SDT-based studies. For example, Vierling et al. (2007) showed using path analysis of data obtained from 237

low socioeconomic status school children, that relative autonomous motivation towards physical activity positively predicted pedometer steps measured over four days after controlling for the possible confounding effects of age and gender. While these findings are promising, a limitation of pedometry is that intensity of physical activity cannot be derived from step counts (Bassett & Strath, 2002). In light of these limitations, Standage, Sebire, and Loney (2008) examined whether the previously identified relationships between autonomous and controlled exercise motivation and self-reported exercise behaviour would hold when behaviour was objectively quantified in terms of intensity and duration. These authors employed recently developed technology (Actiheart; Cambridge Neurotechnology, UK) which uses a branched equation to predict energy expenditure from simultaneously recorded heart rate and accelerometry data. After controlling for the potential confounding affects of gender and body composition, the findings provided initial evidence that autonomous behavioural regulations positively predicted time spent in moderate physical activity (i.e., between 3 and 6 METs¹) for bouts of ≥ 10 and 20 minutes in duration. Controlled motivation was unrelated to exercise behaviour. Importantly, these findings advance the exercise motivation literature by showing that SDT-derived concepts are useful in predicting engagement in exercise at levels that are deemed to be health enhancing (Haskell et al., 2007).

While the findings reviewed generally assert that autonomous but not controlled motivation is positively associated with exercise behaviour, a number of studies have shown positive relationships between introjected regulation and exercise behaviour (Edmunds et al., 2006b; Wilson et al., 2004). Such observations corroborate the findings of Vallerand, Fortier and Guay (1997) in the education context. Specifically, Vallerand et al. found that compared to students who dropped out of high school, those who persisted displayed greater levels of introjected regulation towards school. Studies have also failed to find relationships between intrinsic motivation and exercise behaviour when controlling for the other regulation types (Edmunds et al., 2006b). Such findings are in contrast to the hypotheses forwarded within SDT and suggest that as a dependent variable, exercise behaviour may represent an interesting case which warrants greater consideration pertaining to its prediction by SDT-based variables. With regards to the lack of a positive relationship between intrinsic motivation and exercise behaviour; as alluded to earlier in this section on OIT, not all health behaviours (i.e., exercise) are always

inherently satisfying or pleasurable to pursue (Ryan, Patrick et al., 2008). It is more reasonable perhaps to expect more autonomous and well-internalised forms of extrinsic motivation (i.e., integration and identification) to predict behaviour (Ryan, 1995). The findings pertaining to introjected motivation for exercise seem more complex. It is purported within SDT that introjected motivation is a controlling regulation manifested by self-imposed sanctions such as guilt, shame and pride. However to feel guilt for sedentarism (and thus be moved to exercise), one must have at least passively understood (although not identified with) the benefits of exercise. Further, performing exercise to bolster one's pride reflects an approach orientation. To this end it is hypothesised that introjected motivation may facilitate exercise initiation and short-term persistence but unless the intjects are internalised, exercise adherence will not be maintained (Edmunds et al., 2006b). These hypotheses have been supported in the sporting domain (Pelletier, Fortier, Vallerand, & Briere, 2001). Specifically, in a prospective study of competitive swimmers, Pelletier and colleagues found that introjected regulation for practicing their sport positively predicted persistence at swimming at 10-month follow-up but not at 22-month follow up which was positively predicted by more autonomous motivational regulations (i.e., intrinsic motivation and identified regulation). Similar findings were observed in a study of obese children. Specifically, Vansteenkiste, Simons, Braet, Bachman, and Deci (2005) found that participants who received an autonomy-supportive experimental manipulation and those who received an experimental guilt-inducing manipulation for learning about improved nutrition ate more fruit and fewer sweets and drank fewer soft drinks one week following the manipulation. However, while those in the autonomy-supportive group continued to maintain or improve their changes in healthy eating three weeks later, the guilt-induction group did not.

In the exercise domain, Thøgersen-Ntoumani and Ntoumanis (2006) identified that exercisers classified as being in the maintenance stage according to the transtheoretical model (i.e., those who have exercised regularly for > 6 months) displayed higher introjection than individuals in the preparation and action stages. It is important therefore for future research to pursue investigations that examine the longitudinal effects of introjected exercise motivation; as the available evidence suggests that with regards to exercise behaviour at least, introjected motivation may have an adaptive role in the short- and moderate-term. This said, while introjected regulation may provide the push to increase one's exercise quantity (i.e., behaviour)

it is important to consider the quality of the experience of an individual exercising for introjected reasons which may be characterised by anxiety, guilt and contingent self-worth (Ryan & Deci, 2007). Indeed research concerning dietary behaviours has shown the regulation of eating behaviours through introjection to correlate positively with bulimic and depressive symptomology and negatively with self-esteem and life-satisfaction (Pelletier, Dion, Slovinec-D'Angelo, & Reid, 2004). Similar affective concomitants of introjection in the exercise domain may undermine continued behavioural persistence or initiate maladaptive behavioural engagement (Edmunds, Ntoumanis, & Duda, 2006a; Hamer, Karageorghis, & Vlachopoulos, 2002).

Supporting the SDT-based hypotheses of a human integrative process within the exercise domain, a number of studies have documented positive associations between more self-determined forms of exercise motivation and exercise-based psychological need satisfaction. Support has emerged for this relationship from cross-sectional and prospective studies of samples of pupils in a PE context (Ntoumanis, 2001, 2005; Standage et al., 2005; Standage & Gillison, 2007), a population of “at risk” minority school children (Vierling et al., 2007), adults participating in a 12-week structured exercise program (Wilson et al., 2003) and British adults (Edmunds et al., 2006b).

In summary, the theoretical tenets pertaining to OIT provide an appealing multi-dimensional framework with which to study motivation. Further, the central hypotheses of OIT have largely gained support via empirical investigations in the exercise domain. Concurrently, the exercise domain provides its own idiosyncrasies, such as difficulty measuring exercise behaviour and the role of introjected regulation in the prediction of cognitive and affective outcomes. As such, further research is indeed warranted in this important domain. In the context of the present thesis, as goal content and behavioural regulation are theoretically intertwined, yet conceptually differentiated and proposed to have independent effects on cognitive and affective variables (Sheldon, Ryan, Deci, & Kasser, 2004), understanding the evidence pertaining to the effect of certain behavioural regulations on adaptive outcomes is important. In Study 1 (Chapter 3) autonomous and controlled behavioural regulations are employed to explore whether intrinsic and extrinsic exercise goals are located in the nomological network of SDT. In Studies 2 and 4 (Chapters 4 and 6 respectively) relative autonomous, autonomous and controlled behavioural regulations are employed respectively to test the SDT-derived

hypothesis that the “what” (i.e., goal content) and the “why” (i.e., behavioural regulation) of goals both contribute to the prediction of variance in exercise-based outcomes. Evidence was also presented showing that more self-determined forms of motivation are related to the satisfaction of psychological needs in the exercise context. It is to these needs that the focus of this Introduction now turns.

1.4.3 Basic Needs Theory

The three psychological needs for autonomy, competence and relatedness form an integral part of SDT, not least by specifying the conditions for development of self-determined motivation and providing theoretical mediators with which to study the differential effects of diverse goal content and goal motive. As the requirement for satisfaction of the psychological needs is proposed to be innate, they are differentiated from motivations, goals and desires which are more learnt in nature (Deci & Ryan, 2000). Basic needs theory (BNT; Ryan & Deci, 2002) was formulated to: (a) clarify the meaning of the psychological needs; and (b) specify the theoretical relationships between the psychological needs, physical health and psychological well-being. At this point it is important to clarify that within SDT well-being is viewed through a eudaimonic rather than hedonic lens (see Ryan, Huta et al., 2008). While the latter approach equates well-being with happiness and pleasure, the former approach defines well-being as being fully functioning, and realising one’s valued human potentials (Ryan, Huta et al., 2008).

With regards to the meaning of the psychological needs, to be considered a true psychological need, a construct must enhance integration and well-being when satisfied and promote disintegration and diminish well-being when thwarted (Ryan & Deci, 2000). In addition, the psychological needs are considered innate and universal, that is, their satisfaction is a condition of optimal human functioning regardless of age, gender and ethnicity/culture (Deci & Ryan, 2000). Despite hypotheses specifying the universality of psychological needs, the means by which different groups (i.e., Russian vs. British citizens) achieve need satisfaction is not necessarily identical, and may differ depending on the particular values forwarded in certain cultures (Deci & Ryan, 2000). From the SDT perspective, the satisfaction of the three psychological needs is the essence of the organismic, growth-oriented theory, however psychological need satisfaction should occur as a by-product of an individual’s behaviours or actions and not be sought explicitly (Deci & Ryan, 2000). Finally, while numerous other candidate needs have been proposed (see Sheldon et

al., 2001), at this time SDT continues to forward autonomy, competence and relatedness as the essential nutrients required for optimal functioning (Ryan & Deci, 2000).

Empirical research has supported the hypothesised relationships between the three psychological needs and well-being at the global life-level (Reis, Sheldon, Gable, Roscoe, & Ryan, 2000). Specifically, Reis et al. (2000) asked 67 university students to report their daily well-being and need satisfaction in a diary on 14 consecutive nights. After controlling for trait-level and prior-day well-being, satisfaction of each of the three needs was significantly associated with a composite well-being score indexed by positive and negative affect, vitality and absence of physical symptoms (i.e., difficulty breathing or soreness).

Wilson et al. (2006) developed and validated the psychological needs satisfaction in exercise scale (PNSE) which facilitated contextual analysis of psychological need satisfaction in the exercise domain. Investigations have used the PNSE and other psychological need satisfaction scales adapted from different contexts to study the correlates of psychological need satisfaction in the physical domain. Studies in PE, sports and of adult exercisers have supported the hypotheses postulated in BNT and extended the list of adaptive consequences conferred by basic need satisfaction from well-being to behavioural (e.g., self-reported exercise behaviour) and cognitive-attentional (e.g., concentration) indices. Specifically, within PE, Standage et al. (2005) demonstrated that perceptions of PE-based psychological need satisfaction (in this case specified as a composite latent variable) among a large cohort of British secondary school children indirectly positively predicted concentration, positive affect and preference for challenging tasks and indirectly negatively predicted unhappiness scores (via motivational regulations). Standage and Gillison (2007) extended these findings, showing that in a similar cohort, perceived autonomy and competence need satisfaction were positively indirectly predictive of health-related quality of life and self-esteem (again via motivational regulations).

Support for the hypotheses of BNT in the exercise context has also been found among adult samples (see Edmunds, Ntoumanis, & Duda, 2007; Wilson & Rodgers, 2007 for reviews). Specifically, Wilson, Longley, Moun, Rodgers, and Murray (2006) provide initial evidence that exercise-based psychological need satisfaction is associated with adaptive scores on global (i.e., subjective vitality) and

contextual level (i.e., positive and negative affect typically experienced during exercise) indices of well-being. In addition, Edmunds, Ntoumanis, and Duda (2006b) identified that amongst a sample of 369 adults, exercise-based competence need satisfaction positively predicted variance in self-reported strenuous exercise in a multiple regression analysis containing age, gender, autonomy and relatedness, intrinsic motivation and the three extrinsic forms of motivation. In this analysis, autonomy and relatedness need satisfaction failed to add significantly to the prediction of exercise behaviour despite displaying positive univariate correlations with this outcome in preliminary analyses. Subsequent mediation analyses revealed that the effect of competence on strenuous exercise was only partially mediated by identified behavioural regulation and thus had both direct and indirect effects on exercise behaviour. Finally, employing a three-wave prospective design in a sample of 261 British university students, Hagger, Chatzisarantis, and Harris (2006) corroborated these findings and showed that exercise-based psychological need satisfaction both directly and indirectly (via self-determined motivation) positively predicted exercise-based attitude and perceived behavioural control constructs from the theory of planned behaviour (Ajzen, 1991) and had a direct effect on the subjective norm component.

Research of the hypotheses forwarded in BNT is still in its infancy relative to the empirical research concerning the correlates of motivational regulations in the exercise context. However, the evidence presented suggests that in general, the hypotheses of BNT regarding the nature and utility of the psychological needs for autonomy, competence and relatedness hold within the exercise domain. Such research also highlights the multi-faceted function of psychological needs within SDT, showing that in addition to being a necessary requirement of the human integrative tendency forwarded in OIT, the basic needs are also critical antecedents to optimal functioning. The basic psychological needs also provide a conceptual basis for the goal content aspect of SDT which forms the main focus of research within the present thesis.

1.4.4 Goal Content: The “What” of Motivation

The concept of goal content forwarded in SDT is the main theoretical focus of the present thesis. The Introduction sections of the empirical Chapters present contextually relevant reviews of research pertaining to goal content in the exercise domain. Therefore, to avoid replication, the aim of this section is to present the

theoretical concepts and broader empirical evidence pertaining to SDT-based goal content research.

Deci, Ryan and colleagues (Deci & Ryan, 2000; Ryan, Patrick et al., 2008) contend that comprehensive understanding of the conditions for optimal human functioning is not limited to the concepts of intrinsic motivation and the internalisation of extrinsic motivation, (i.e., the “why” of motivation). Recent progressions in the SDT literature (see Kasser, 2002; Vansteenkiste, Ryan, & Deci, 2008; Vansteenkiste, Soenens, & Duriez, 2008 for reviews) have highlighted the utility of also investigating the content of individuals’ goal (or aspiration) pursuits (i.e., the “what” of motivation). As the basic needs are a definitional starting point for classifying goals, work pertaining to goal content falls under the umbrella of BNT within SDT (Ryan & Deci, 2002).

In the goal content framework goals are classified into two groups; *intrinsic* and *extrinsic*. Intrinsic goals are defined as those which are more closely linked to basic psychological need satisfaction (Deci & Ryan, 2000). As such, in addition to intrinsic motivation and internalisation, intrinsic goal pursuit has been labelled as the third manifestation of the human natural tendency towards growth (Vansteenkiste et al., 2006) aligning with the organismic principles of SDT. Goals (or aspirations) such as affiliation, personal growth, community contribution and health/fitness are examples of life-level intrinsic goals (Kasser & Ryan, 1993, 1996). In contrast, goals concerned with obtaining external indicators of worth or contingent approval are hypothesised to be unsatisfying of basic psychological needs and are classified as extrinsic (Deci & Ryan, 2000). Extrinsic life-level goals reflect central aspects of consumer culture (Kasser, Cohn, Kanner, & Ryan, 2007) such as goals for amassing wealth, being well-known or famous and having an attractive appearance (Kasser & Ryan, 1993, 1996). The differentiation of goals within SDT is similar to the contentions of humanistic philosopher Erich Fromm (1976) who distinguished two forms of human existence; *having* and *being*. Fromm’s concept of a *being orientation* is related to self-actualisation, growth and fulfilment of one’s inner potentials. Conversely the *having orientation* is focused towards garnering wealth, possessions and status.

Previous research has supported the SDT-based grouping of goals as intrinsic and extrinsic using factor analysis (Kasser & Ryan, 1996) and multidimensional scaling analysis (Grouzet et al., 2005). Grouzet et al. identified a circumplex model

of life-aspirations with varying content (Figure 1.3). In this model, goal factors are ordered around the circumference of a circle with goals proximal to each other being compatible and goals distal from one another being in conflict.

This research also showed that the factoring of goals as intrinsic or extrinsic transcended a number of different cultures. From the circumplex model of goals it is clear that while some goals are located at the limits of the horizontal axis representing intrinsic or extrinsic goal content, goals such as hedonism and spirituality are neither intrinsic nor extrinsic in content. To this end, this research supported the SDT-based proposition that the conceptualisation of goals is not all-encompassing, in that it is not possible to classify all goals as either intrinsic or extrinsic (Ryan, Huta et al., 2008).

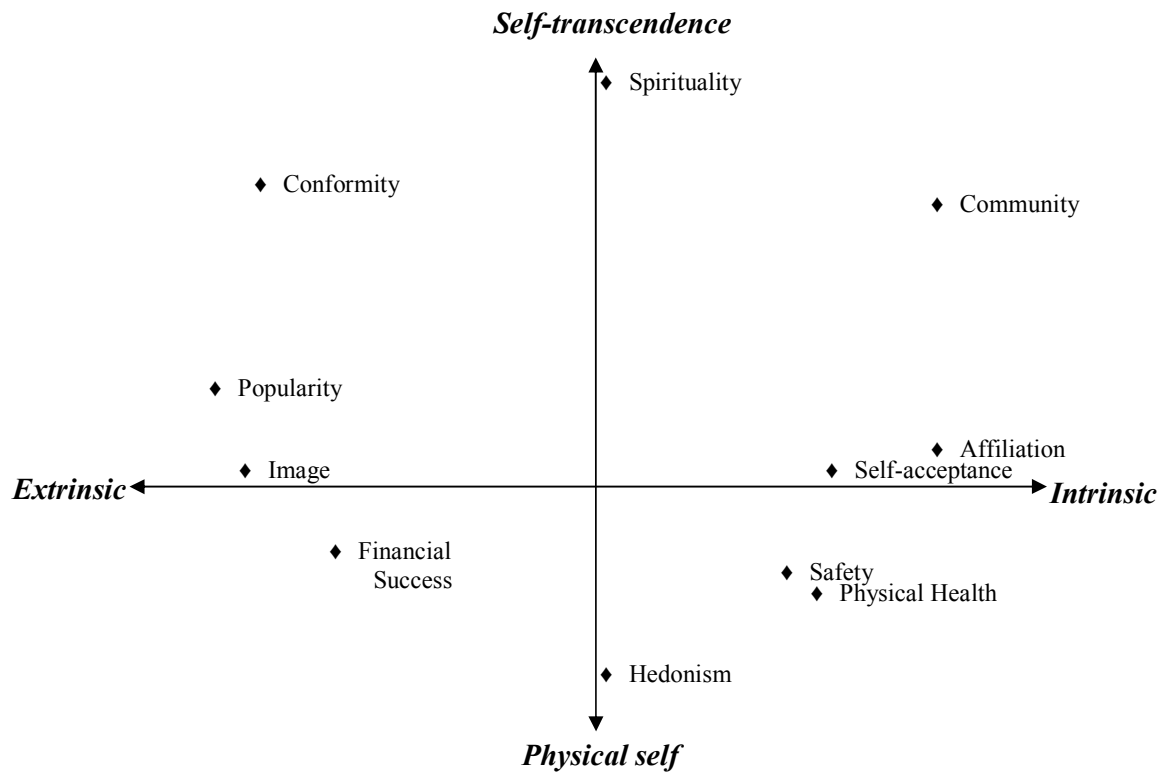


Figure 1.3 Circumplex model of life aspirations (Grouzet et al., 2005).

Ryan, Huta et al. (2008) suggest that when defining a goal, it is sometimes necessary to probe “surface goals” in order to uncover a derivative (or first order) goal. First order goals are usually reflective of intrinsic goals, in that they cannot be reduced to any other underlying goals and do not exist in the service of another goal. If a goal can be reduced further (i.e., it is a second order rather than a first order goal) Ryan, Huta et al. (2008) contend that such a goal would be extrinsic. To demonstrate how this definitional process translates to the exercise domain, Figure 1.4 extends Ryan, Huta et al.’s (2008) example to a scenario in the exercise context. Firstly in both scenarios, from a goal content perspective the client's goal of weight loss is ambiguous and cannot be classified as either intrinsic or extrinsic (i.e., the client could equally wish to lose weight to reduce their risk of poor health or to change their appearance). In the first scenario the client reveals a goal for health (via weight loss) which is clearly aligned with the previously identified intrinsic goal of physical health/fitness (Kasser & Ryan, 1993, 1996). When probed, the goal for health is irreducible to other goals, confirming its definition as intrinsic.

In the second scenario, the client reveals a goal for improved appearance (via weight loss) which Kasser and Ryan (1993; 1996) have previously classified as an extrinsic goal. When probed, the client’s goal for attractiveness is further reduced to a desire for peer acceptance. According to Ryan, Huta et al., (2008) being reducible to a derivative goal suggests that the goal for attractiveness is extrinsic.

These examples of exercise-based goal scenarios highlight that while at the surface-level some goals may be neither intrinsic nor extrinsic, such goals may be definable if probed to uncover the derivative goal content. This discussion is returned to in Chapter 3 of the present thesis when considering goal domain clarity in a measure of SDT-based intrinsic and extrinsic goal content (i.e., the Goal Content for Exercise Questionnaire).

Scenario 1: Intrinsic Goal

Practitioner: What is your goal for your exercise regime?

Client: To lose weight.

Practitioner: What is your weight loss goal?

Client: I want to get healthy again.

Practitioner: What do you want to be healthy for?

Client: Well because it's just better to be healthy, everyone wants to be healthy don't they?

Scenario 2: Extrinsic Goal

Practitioner: What is your goal for your exercise regime?

Client: To lose weight.

Practitioner: What is your weight loss goal?

Client: To look better, being overweight is unattractive.

Practitioner: What do you want to be attractive for?

Client: Well, because my friends make fun of my weight and I want them to stop and have some respect.

Figure 1.4 Exercise-based scenarios highlighting the definition of intrinsic and extrinsic goals.

1.4.5 Correlates of Intrinsic and Extrinsic Goal Importance

Contemporary consumer culture is fuelled by glamorous media advertisements, celebrity endorsements and a subtle stream of slogans and airbrushed images that promote products, appearances and lifestyles. Such advertising suggests that if the average person achieves the advertised state, appearance or product they will be more fulfilled, popular and happier than they

would be without it (Dittmar, 2008). In addition, such promising rewards are offered for very little investment of effort or time, all one need do is purchase a new body lotion or the magazine which holds the secret of the “easy 20-minute workout” or “hard abs in 3 simple moves.” Figure 1.5 shows three advertisements (i.e., two magazine covers and one online advertisement) that promote such philosophies by combining physical exercise and aspirations for beauty. With these images in mind, it is not surprising that individuals are tempted to place importance on life-level and context-specific (e.g., work or exercise) goals which they believe will lead to the perfect life or body.

Experimental research concerning impression formation supports the apparent desirability of exercising or being seen as a fit and healthy exerciser (Martin, Sinden, & Flemming, 2000). Specifically, Martin et al. (2000) randomly assigned 627 adults aged 18-30 years to one of six conditions in which they read a manipulated paragraph describing a target person. The six conditions reflected a 2 (gender) x 3 (exercise status: exerciser, non-exerciser, control - no exercise information) factorial design. After reading the description of the exerciser (i.e., “Mary/Tom exercises regularly, working out at the gym 4 or 5 days each week. Her/His exercise program consists of jogging, fitness classes and some weight training”), non-exerciser (i.e., “Mary/Tom is physically inactive and does not participate in activities such as jogging, fitness classes and some weight training”) and control (i.e., no mention of the target’s exercise habits), participants rated the target on a range of personality and physical attributes. The results showed a main effect ($\eta^2 = .18$) of exercise status on personality attributes in that the exercising target was considered significantly more hard-working and confident and to have greater self-control than the non-exerciser and control targets.

Emphasising a negative evaluation of inactive individuals, compared with the non-exerciser, the exerciser and control targets were rated as having more friends, being happier, more sociable and friendlier. A main effect of exercise status on ratings of physical attributes also emerged ($\eta^2 = .32$). Specifically, the exercising target was considered to be healthier, more attractive, fitter, stronger and more sexually attractive than the non-exerciser and control targets. A positive exerciser stereotype has recently been shown to be similarly endorsed by regular exercisers and non-exercisers who do and do not intend to commence exercise (Rodgers, Hall, Wilson, & Berry, 2009).



Figure 1.5 Examples of exercise-based consumer advertisements.

These findings suggest that some members of contemporary society may have bought-in to messages such as those promoted in Figure 1.5 and therefore equate being an exerciser with a number of favourable personality and appearance-based outcomes. If exercise is viewed as a commodity in this way, or as the path to the “body perfect” or “good life” (Dittmar, 2007, p. 24) it is understandable that individuals may want to pursue enticing extrinsic exercise goals for appearance and social recognition alongside other life-level extrinsic aspirations.

Initial research of intrinsic and extrinsic goals concerned the effects of people’s aspirations (or important life-goals) on their well-being (Kasser & Ryan, 1993, 1996). Using various versions of the Aspiration Index, Kasser and Ryan have assessed the importance that people place on intrinsic aspirations of self-acceptance,

affiliation, community feeling (Kasser & Ryan, 1993, 1996) and physical health (Kasser & Ryan, 1996) and extrinsic aspirations of financial success (Kasser & Ryan, 1993, 1996), fame/social recognition and appearance (Kasser & Ryan, 1996). While Kasser and Ryan were among the first to empirically analyse the relationships between intrinsic and extrinsic goal striving and well-being, the earlier writings of Fromm (1976) provide insight as to the potential effects of adopting a *having* versus a *being* way of life. Captured in the quote “If I am what I have and if what I have is lost, then who am I?” (Fromm, 1976, p. 89), Fromm proposed that humans would experience an unstable identity and negative affective states if they hinged their identity upon the “having” orientation because when the material possessions that define the self are withdrawn, the person’s sense of identity is lost. Fromm suggested that a self defined in terms of “being” cannot be threatened in this way and is therefore more stable and likely to be associated with adaptive functioning.

Aligned with Fromm’s (1976) propositions, it is important to note that from the SDT perspective it is the relative contribution of intrinsic versus extrinsic goals to one’s overall goal system that is important rather than absolute goal scores (Deci & Ryan, 2000; Sheldon & Kasser, 2001). Vansteenkiste, Ryan, and Deci (2008) emphasise that although some degree of extrinsic goal achievement (e.g., some wealth, social recognition and attractiveness) is important, negative effects will occur when such goals take precedence over, and thus “crowd out” intrinsic goals (e.g., physical health, community contribution and social affiliation) that are more likely to yield psychological need satisfaction.

Relative goal scores have been calculated and mean goal scores have been controlled for using a number of methods including: (a) the statistical control method; entering the mean goal score (of all goals irrespective of their content) in the first step in hierarchical regression analyses (Kasser & Ryan, 1993), (b) the composite subtraction method; summing intrinsic and extrinsic goals as individual composite scores and subtracting one from the other (Sheldon & Kasser, 1998; Sheldon & Krieger, 2004), and (c) the mean correction method; subtracting the mean score for all goals from individual goal factors and using either individual goal, or intrinsic and extrinsic composite variables (Williams, Cox, Hedberg, & Deci, 2000). As this practice is common within the goal content literature, results reported in the review below are from investigations using relative goal scoring methodologies unless otherwise stated.

In the first of a series of three studies, Kasser and Ryan (1993) found that placing relatively strong importance on self-acceptance, affiliation and community feeling life aspirations was positively correlated with self-actualisation and vitality whereas valuing financial success was negatively associated with these outcomes among a sample of American undergraduate students. These findings were corroborated by the results of Kasser and Ryan's (1993) second study with undergraduate students in which it was also found that intrinsic aspiration importance was negatively correlated with scores on depression and anxiety inventories, outcomes which were positively correlated with valuing the aspiration of financial success.

In the third study, the findings were extended to a sample of 140 18-year-old adolescents whose global functioning and social productivity was assessed via questionnaire and whose behaviour disorders (e.g., school disciplinary problems and stealing) were assessed through interview with a clinician who also interviewed the adolescents' mothers. After controlling for average aspiration importance, adolescents' global functioning was positively associated with higher importance on self-acceptance and affiliation aspirations and negatively associated with financial success aspirations. Social productivity was positively related to social affiliation aspirations and negatively related to aspirations for financial success. Finally, the adolescents' behavioural problems were negatively associated with aspirations for self-acceptance and community contribution and positively predicted by financial success aspirations.

Kasser and Ryan (1996) corroborated and extended their initial findings in two further studies. Specifically, the relative intrinsic goal scores of 100 adult Americans were shown to positively correlate with self-actualisation and vitality, and were negatively associated with depression, anxiety and physical symptoms (e.g., headaches). Relative extrinsic goal importance (including fame and appealing image goals in addition to financial success) was negatively associated with self-actualisation and vitality and positively associated with physical symptoms (Study 1). Further, in a college-aged sample, evidence of the effect of intrinsic and extrinsic goal pursuit was extended to indices of positive affect and narcissism (Study 2). Since these initial investigations, Ryan et al. (1999) have identified similar correlational relationships between intrinsic and extrinsic goals and well-being outcomes in student populations from both the USA and Russia providing evidence

for within- and between-culture effects of life-aspiration (goal) content thereby extending the findings to cultures with varied economic and cultural value structures.

In addition to poorer well-being, relative extrinsic life-goal importance has been shown to predict other maladaptive outcomes such as risky health behaviours (Williams et al., 2000) and poor social functioning (Duriez, Vansteenkiste, Soenens, & De Witte, 2007). On the other hand, intrinsic goals for physical health or a valuing of health have been found to be associated with healthy behaviours such as tobacco abstinence (Niemic, Ryan, Deci, & Williams, 2009), less alcohol misuse (Reifman, Barnes, Dintcheff, Uhteg, & Farrell, 2001) and an index of positive health practices (Shi, Nakamura, & Takano, 2004). Specifically, Williams et al. (2000) showed that among 14- to 18-year-old American students, importance ascribed to extrinsic aspirations positively predicted an index of risk behaviours which included alcohol consumption and smoking tobacco and marijuana. It was concluded that the more extrinsic goal-oriented teenagers participated in risky behaviours in the hope of attaining need substitutes pursued to compensate for presumed need thwarting experienced in their environment. Recently, Niemic et al. (2009) extended the findings of Williams et al. to an adult population using data from a randomly controlled trial of an SDT-based intervention aimed at helping smokers give up smoking. Specifically, in a sample of 826 smokers randomised to treatment (i.e., an SDT-based autonomy-supportive intervention) and control (i.e., community care) conditions it was found that aspirations for physical health reported at baseline were maintained in the intervention group compared to the control group for whom physical health aspirations became less important. Further, the maintained aspirations for physical health were positively associated with biochemically validated prolonged tobacco abstinence at 24-month follow up.

Evidence pointing towards the importance of intrinsic goals for physical health in adopting health enhancing behaviours has also been identified in the study of human values from non-SDT perspectives (see also Kasser, 2002 for a review of non-SDT based investigations of materialistic values and well-being). Reifman et al. (2001) reported that the importance placed on health values in their sample of adolescents negatively predicted alcohol misuse and moderated the effect of an environmental risk index (i.e., a variable reflecting factors such as friends' drinking, parental alcohol abuse and monitoring/communication) on alcohol misuse. In a prospective study of 334 adult males, Shi et al. (2004) found that placing a high

value on health was associated with positive changes over three years in interview-assessed positive health practices including consuming a balanced diet, balancing work and rest, and exercising. With regards to social functioning, Duriez et al. (2007) identified that relative extrinsic life goal pursuit positively predicted both social dominant attitudes (e.g., “It’s sometimes necessary to step on others to get ahead in life”) and racial prejudice, suggesting that those with an extrinsic value orientation might adopt a “win at all costs” perspective.

Finally, recent research extending the concept of life aspirations to the study of context-specific intrinsic and extrinsic goal pursuit has corroborated previous findings pertaining to outcomes at the global and contextual levels. For example, after controlling for age, educational level and income in a sample of 885 Belgian employees, Vansteenkiste et al. (2007) found that extrinsic work-related goals (e.g., having good pay) relative to intrinsic goals (e.g., having a job that is interesting) were negatively associated with global indices of life satisfaction, life happiness and contextual level variables such as job satisfaction.

It is clear from the evidence presented that the importance people place on different life-domain and contextual-level goals can have consequences for their well-being and social functioning, but that the consequences are only adaptive if the goal is intrinsic in content. Extending this research to the exercise domain, the present thesis focuses on the relative importance of exercise goals that are classified as intrinsic or extrinsic from the SDT perspective and the possible effects that valuing these goals might have on cognitive, affective and behavioural exercise-based outcomes and phenomenological experiences of exercise. To avoid repetition, literature pertaining to exercise-based goal content is presented in the Introduction sections of each empirical chapter in the present thesis (Chapters 3 to 6).

1.4.6 The Role of Intrinsic and Extrinsic Goal Attainment

In addition to the importance placed upon intrinsic and extrinsic goals, researchers have also investigated the correlates of the rated likelihood of attainment, and the perceived attainment of intrinsic and extrinsic goals. Extending the contentions of other theorists (e.g., Bandura, 1977) that forward the positive effect of attaining, or being confident of attaining valued goals irrespective of their content, examination of intrinsic and extrinsic attainment facilitates the exploration of whether extrinsic goal pursuit yields lower well-being because such goals are more

difficult to attain, and whether the previously noted negative effects of extrinsic goal pursuit are moderated by successful goal attainment.

In line with findings pertaining to goal importance, Kasser and Ryan (1993; 1996) showed that scores indicating the likelihood of successfully attaining intrinsic and extrinsic goals was positively and negatively associated with indices of well-being respectively. Sheldon and Kasser (1998) corroborated these findings in a prospective study in which 90 university students reported the goals underlying five personal projects. The student participants rated the degree to which their projects would take them closer to three intrinsic and three extrinsic “possible futures” which were analogous to the intrinsic and extrinsic goals forwarded in SDT. For each personal project a relative intrinsic orientation score was calculated by subtracting summed extrinsic possible future ratings from summed intrinsic possible future ratings. Well-being (i.e., life-satisfaction, depression and positive and negative affect) was measured at the beginning and end of an academic semester (12 weeks). Well-being (i.e., how much participants had experienced five negative and four positive moods) was also reported by participants on the fifth day of each of the 12-weeks. Finally, on the fifth day of each of the 12-weeks, participants also rated how much short-term progress they had made towards each personal project in the previous five days. The 12 weekly short-term progress scores were averaged to form a semester progress score. Using each short-term period as the unit of analysis, the results showed that short-term project progress significantly predicted reduced negative affect, increased positive affect and increased combined well-being in the short-term. Semester progress was associated with positive changes in life satisfaction, positive affect and the combined index of subjective well-being. Interaction analyses further revealed that relative intrinsic goal content moderated the effect of short-term- and semester progress on changes in well-being scores. Specifically, students who made progress towards intrinsically-oriented personal projects between the start and end of the semester experienced greater positive changes in life satisfaction, positive affect and combined subjective well-being. Students who made progress towards extrinsically-oriented personal projects experienced no change in subjective well-being. Such findings were taken to suggest that the degree to which progress towards one’s goals effects well-being depends upon the content of the goals themselves (Sheldon & Kasser, 1998). Although Sheldon and Kasser did not report the mean attainment of intrinsic and extrinsic

aspirations, they did test the alternative explanation for their findings; that intrinsic goals are more abstract and therefore less difficult to attain than extrinsic goals. Using Emmons' criteria the authors coded the level of abstraction for each goal. Level of abstraction was unrelated to changes in well-being. The moderating effect of intrinsic goal content on the effect of goal progress on well-being was unaltered after including level of goal abstraction in the regression equation.

To ascertain whether these observations were consistent across cultures, Ryan et al. (1999) assessed the perceived current attainment of intrinsic and extrinsic goals and well-being in 116 American and 183 Russian university students. Results largely supported previous findings and showed that perceived attainment of intrinsic goals accounted for variance in all well-being outcomes (e.g., life-satisfaction, depression and positive and negative affect) whereas perceived extrinsic goal attainment did not explain any additional variance in three of the four outcomes. Only in the Russian sample did extrinsic goal attainment account for variance in life-satisfaction. Using a different technique to the relative goals scoring procedure, Kasser and Ryan (2001) formed four groups of American students based on their self-reported intrinsic and extrinsic aspiration attainment (i.e., high intrinsic, low extrinsic; high extrinsic, low intrinsic; high intrinsic, high extrinsic; and low intrinsic, low extrinsic). Between-groups analysis identified that the "high intrinsic, low extrinsic" group had greater well-being and self-esteem and relationships of higher quality with friends and romantic partners than those in the "high extrinsic, low intrinsic" group. Notably, scores on the well-being, self-esteem and relationships-quality variables did not differ between those in the "high intrinsic, high extrinsic" group and those in the "high intrinsic, low extrinsic" group, suggesting that there was no additive effect on the adaptive outcomes assessed from the attainment of extrinsic goals in addition to intrinsic goals. The group who reported low attainment of both intrinsic and extrinsic goals reported the most maladaptive profile, however participants in the "high extrinsic, low intrinsic" group did not differ significantly from the "low-low" group in their well-being or self-esteem, and reported worse romantic and friend-based relationships. Finally, in a recent correlational study of a sample of older adults, Van Heil and Vansteenkiste (in press) observed that the degree to which participants were able to attain their intrinsic goals during their lives was positively associated with life satisfaction, ego-integrity and acceptance of death and negatively associated with depression, despair

and death anxiety. In contrast, the attainment of extrinsic goals was unrelated to life satisfaction, negatively related to death acceptance and positively related to despair.

Recently, Niemiec, Ryan, and Deci (in press) have corroborated and advanced these previous findings in a longitudinal study of the attainment of aspirations of post-college graduate sample. Firstly, Niemiec et al. observed that intrinsic and extrinsic goal importance rated shortly before graduation was positively associated with intrinsic and extrinsic goal attainment one year later. Intrinsic goal attainment one year post-graduation was positively related to concurrently measured well-being and negatively related to ill-being, whereas attainment of extrinsic goals was positively associated with ill-being and unrelated to well-being. Further, Niemiec et al. identified that change in participants' intrinsic aspiration attainment from graduation to one year later positively predicted change in well-being, and this was partially mediated by change in psychological need satisfaction. Change in ill-being over the 1-year follow-up was predicted negatively by change in intrinsic aspiration attainment and positively by change in extrinsic aspiration attainment. The effect of change in intrinsic aspiration attainment on well-being was partially mediated by change in psychological need satisfaction.

It is important to note that not all empirical investigations have found exclusively negative correlations between financial success aspiration attainment and subjective well-being outcomes. For example, although Nickerson, Schwarz, Diener, and Kahneman (2003) identified a negative correlation between a financial success goal (measured using a single item) and overall life satisfaction, this effect was moderated by household income (i.e., a proxy marker for attainment of financial success). Specifically, for participants with higher earnings, life satisfaction was unaffected by the strength of their financial success goal. In subsequent analyses however, life satisfaction was decomposed into a number of specific indicators of life-domain satisfaction. In these analyses the negative relationship between financial success aspirations and satisfaction in domains of family life, friendships and participants' job remained significant after adjusting for household income corroborating the findings of Kasser and Ryan (2001). Pertinently, satisfaction with family life and participants' job were the strongest predictors of overall life-satisfaction in this sample. These findings point to the potential detrimental effect of extrinsic aspiration salience on important components of well-being.

Although it is intuitive that goal attainment would confer adaptive outcomes regardless of the goal content (i.e., as long as the stock broker achieves their materialistic pursuits then they would be happy), the available evidence provides little support for this hypothesis. Instead, the balance of evidence suggests that in general only attainment of goals that are congruent with one's innate psychological needs (i.e., intrinsic goals) yield adaptive outcomes such as psychological well-being and satisfaction within important life-domains.

1.4.7 Goal Content and Psychological Need Satisfaction

It is forwarded in SDT that the differential effects of relative intrinsic and relative extrinsic goal pursuit can be accounted for by the degree of psychological need satisfaction that such goal pursuit facilitates (Deci & Ryan, 2000). That is, intrinsic and extrinsic goals are hypothesised to be need-satisfying and need-un-satisfying respectively. Kasser (2002) reviews indirect evidence that supports this hypothesis, however to date only a handful of studies have directly tested this association. Specifically, in a study of 110 Flemish administrative employees, after controlling for work experience, level of education, age, gender and overall intrinsic and extrinsic goal importance, Vansteenkiste, Neyrinck et al. (2007) identified positive relationships between relative extrinsic job-based goals and work-family conflict, emotional exhaustion and intention to change jobs and negative relationships between relative extrinsic job-based goals and job dedication, vitality and satisfaction. In addition, relative extrinsic goals were negatively related to psychological need satisfaction ($r = -.63, p < .001$). Mediation analysis using the Baron and Kenny (1986) sequential steps method showed that the effects of goal content on job-based outcomes were mediated by psychological need satisfaction in the work place. Recently, Thøgersen-Ntoumani, Ntoumanis and Nikitaras (in press) observed similar relationships in large sample of Greek adolescent females. Specifically, Thøgersen-Ntoumani et al. found that the degree to which intrinsic life level aspirations for health were important to the girls was positively associated with their general psychological need satisfaction whereas importance placed on extrinsic aspirations for image was unrelated to psychological need satisfaction.

Study 2 (Chapter 4) of the present thesis presents a test of the hypothesis that the predicted associations between intrinsic relative to extrinsic exercise goals and outcomes at the global (i.e., life) and contextual (i.e., exercise) levels are mediated by exercise-based psychological need satisfaction. This investigation advances

previous research as it represents the first test of this hypothesis in the exercise domain.

Based on the findings of their goal manipulation studies, Vansteenkiste Soenens et al. (2008) have recently suggested that psychological need satisfaction represents a *macro-mediational mechanism* that operates between goal content and outcomes. These researchers also posit a number of cognitive-affective *micro-mediational mechanisms* or processes that might explain the relationship between goal content and psychological need satisfaction. In particular those pursuing extrinsic rather than intrinsic goals are hypothesised to: (a) experience a shift in attention away from the activity in hand and to a focus on external indicators of worth, (b) engage in greater social comparisons with others and (c) adopt a rigid-approach to the activity where engagement is superficial. To date, the macro-mediating role of psychological need satisfaction in the relationship between goal content and outcomes in exercise is untested. As such, the micro-mediational mechanisms that might exist between goal content and need satisfaction in exercise have also not been studied. Building on the examination of the macro-mediational mechanisms in Study 2 (Chapter 4) in Study 3 (Chapter 5) a qualitative approach was adopted to enable exploration of the lived experiences of exercisers and the possible identification of micro-mediational processes in exercise.

1.4.8 Experimental Manipulation of Goal Content

A limitation of much of the research concerning goal content presented thus far is the correlational nature of the data, which prevents conclusions regarding cause and effect between goal content and outcome variables from being established. Tapping into the organismic postulations of SDT (i.e., that the social environment can be manipulated to bring about changes in motivational outcomes) a recent series of studies has addressed this limitation (see Vansteenkiste et al., 2006 and Vansteenkiste, Soenens, & Lens, 2007 for reviews). Vansteenkiste and his colleagues have used a goal framing technique to experimentally manipulate whether an activity (e.g., learning about a certain topic) is pursued for an intrinsic or extrinsic goal. Specifically, this was achieved by presenting participants with a written paragraph (or script) which, within the text, either promotes intrinsic goals (e.g., “performing exercise has been frequently reported to enhance physical health”) or extrinsic goals (e.g., “by taking part in exercise, individuals can maintain youthful looks and appear attractive to others”) for the novel activity. In addition to goal

content promotion, these researchers also phrase the experimental manipulation scripts to create either autonomy-supportive (e.g., using terms such as “you could” and “you might like to”) or controlling (e.g., using terms such as “you should” and “you really ought to”) climates. This facilitates examination of the effects of combinations of goal content and motivational climate manipulations on pertinent criterion variables.

In a series of three experimental goal promotion studies conducted in the education context, Vansteenkiste, Simons, Lens, Sheldon, and Deci (2004) manipulated the goal content (i.e., intrinsic vs. extrinsic) and social context (i.e., autonomy supportive vs. controlling) of three learning tasks; about recycling, communication skills and the exercise of tae-bo, in trainee primary school teachers, marketing undergraduates and high school pupils respectively. In each of the three studies a randomised 2 x 2 factorial design was employed to create four groups crossing goal content and social context manipulations. Learning and performance outcome variables were assessed following goal framing. Results from the three studies showed that relative to extrinsic goal framing, intrinsic goal framing facilitated more adaptive learning (i.e., greater deep and less superficial processing of the learning material and increased underlining) and better performance (i.e., greater test and graded task performance and greater persistence at free choice behaviours linked to the learning activity). The autonomy-supportive relative to controlling learning climate manipulation yielded similar effects while also interacting with intrinsic goal framing to yield an additional synergistic positive effect on performance. Specifically, pupils who received the intrinsic goal content manipulation in an autonomy-supportive manner displayed greater autonomous motivation, evidence of deep learning strategies and higher scores on performance outcomes. This was the only significant interaction identified as autonomy-support and extrinsic goals, and the controlling context manipulation and extrinsic goals did not interact.

Comparable results were found when a similar set of three experiments was conducted in which 11- and 12-year-old adolescents learned about guidelines from a text about nutrition called the Four-leaf Clover that contained intrinsic (i.e., “doing your best to follow the guidelines of the Four-Leaf clover might help you to stay more healthy and might prevent you from being ill”) or extrinsic (i.e., “doing your best to follow the guidelines of the four-leafed clover might help you to become

more physically appealing to others”) goal framing manipulations (Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005). Corroborating earlier findings, intrinsic goal framing was related to more adaptive conceptual learning whereas extrinsic goal framing was related to less adaptive rote learning immediately- and four weeks after goal manipulation.

In a study of 501 16 to 18-year-old PE students learning tae-bo, Vansteenkiste, Simon, Soenens, and Lens (2004) addressed a number of limitations and questions that remained following their previous studies. Specifically in addition to intrinsic (i.e., health) and extrinsic (i.e., appearance) goal framing conditions, two further conditions were experimentally manipulated: (a) a content-free condition where pupils were given a reference to the future importance of the exercise task that was neither intrinsic nor extrinsic and (b) a control condition in which participants were provided with no future reference. In addition, behavioural regulation for tae-bo, self-rated effort, persistence at 1-week, 1-month, and 4-months after goal framing and sports club membership were measured. Contrast analyses showed that the intrinsic goal framing group reported imparting greater effort, displayed higher autonomous behavioural regulation and had greater teacher-rated test performance scores, and greater 1-month and 4-month persistence at tae-bo compared with the participants in the control group. In contrast, compared with the control group, those exposed to the extrinsic goal framing condition reported expending less effort, displayed greater controlled behavioural regulation, were scored lower by the teacher on their performance and showed less persistence at 1-week and 4-month follow-up measurement points, although they were more persistent at 1-month. These findings support the contention that intrinsic goal pursuit yields adaptive outcomes in addition to identifying that extrinsic goals for an activity may be detrimental to effort and long term persistence at the target activity compared with having no goal at all.

The studies conducted by Vansteenkiste and colleagues studies show that goal content can be effectively manipulated via seemingly short and unobtrusive goal framing methodologies. In addition this work corroborates previous findings pertaining to the well-being and health effects of differential life goal pursuit, and demonstrates that there may be a causal relationship between intrinsic and extrinsic goal pursuit and a range of cognitive-attentional and behavioural outcomes including persistence measures of exercise-type behaviours. It remains to be investigated as to whether such forms of goal framing would have similar results in adult populations

in the exercise context. Before conducting such investigations with samples of adult exercisers however, a logical first step is to address more fundamental questions pertaining to exercise-based goal content. As such, the four studies reported in the present thesis address the measurement of goal content, effects of individual differences in exercise goal content on cognitive, affective and subjectively and objectively assessed behavioural variables and phenomenological experiences of intrinsic and extrinsic goal pursuit in an adult samples. The results gleaned from these studies may help to build a foundation for future research in which the effects of experimentally manipulating goals for exercise in adults are investigated.

1.4.9 Antecedents of Intrinsic and Extrinsic Goal Pursuit

Given the differential effects of intrinsic and extrinsic aspirations and domain-specific goal pursuit documented above, it is important to consider the origins of intrinsic and extrinsic goal pursuit. That is, why, if the available evidence suggests that the pursuit extrinsic relative to intrinsic goals is negatively related to well-being, performance and persistence do some people pursue such goals in the first place? Within SDT, the concept of basic psychological needs is again used to shed light on this question. Specifically, it is hypothesised that extrinsic goals are pursued as a means of compensating for previously thwarted autonomy, competence and relatedness needs (Deci & Vansteenkiste, 2004; Kasser, Ryan, Couchman, & Sheldon, 2004).

In examining the antecedents of intrinsic and extrinsic goal pursuit, Kasser, Ryan, Zax, and Sameroff (1995) assessed the aspirations of 140 American 18-year-olds and their mothers. Kasser et al. also determined, via interview, the maternal nurturance provided by the mother to the teenager and assessed maternal parenting style during their teenager's adolescence. The findings showed that mothers who valued financial success relative to more intrinsic goals were more likely to have teenagers who adopted the same value orientation. Additionally, teenagers who placed greater value on financial success relative to intrinsic aspirations were raised in less socioeconomically advantaged households and had mothers who were less nurturing. Despite the cross-sectional methodology, these results were the first to suggest that there may be an intergenerational transmission of life values/goals and that environments which thwart the psychological needs may be related to need-compensating extrinsic goal pursuit. Recent work by Duriez, Soenens, and Vansteenkiste (2008) has also identified evidence for an intergenerational

transmission of anti-social attitudes which was mediated by parental endorsement of extrinsic versus intrinsic goals.

In addition to studies of adolescent populations, the findings of Kasser et al. (1995) were corroborated and extended to an adult sample by Kasser, Koestner, and Lekes (2002) in a longitudinal investigation spanning 26 years. Using a data set made accessible to researchers in 1979, Kasser et al. analysed parenting style data (e.g., restrictiveness and warmth assessed via interview) of mothers who at that time had children aged 5-years-old. Current socio-economic status was also assessed at this baseline point. Twenty-six years later, when the participants (i.e., the mothers' children at baseline) were 31-years-old, their values/goals and present socio-economic status were assessed. Results showed that parental restrictiveness scores were negatively correlated with goals considered intrinsic in content but positively correlated with more extrinsic goals, which were also negatively related to parental warmth. The findings were not mediated by the participants' gender or their socio-economic status at age 5, or age 31. In addition to nurturance during developmental stages, experimental studies have identified that when individuals are exposed to a psychological threat that initiates feelings of insecurity, a value orientation in which extrinsic goals dominate is often adopted (Sheldon & Kasser, 2008). Specifically, in a series of three studies Sheldon and Kasser (2008) experimentally manipulated existential threat (i.e., mortality salience), economic threat (e.g., a negative scenario about personal financial security) and interpersonal threat (e.g., thinking about a conditionally accepting or unconditionally accepting other) in samples of undergraduates and observed that all threat inductions resulted in participants placing greater importance on extrinsic relative to intrinsic goals.

None of these studies directly assessed need satisfaction and are therefore limited in their utility for drawing conclusions pertaining to the causality between salient aspects of the social context (i.e., parental nurturance or psychological threat) and extrinsic goal striving as a compensation for thwarted psychological needs. However, the consistency of results over a range of studies using diverse methodologies adds strength to support for the hypotheses of SDT.

From this discussion in addition to the literature presented on the mediating role of psychological needs in the relationships between goal content and outcomes, it is clear that goal content and psychological needs have a bi-directional relationship in which psychological need satisfaction is hypothesised to account for why people

strive towards intrinsic and extrinsic goals, and also why relative extrinsic goal pursuit has been negatively related to a range of cognitive, affective and behavioural criterion variables. In the present thesis (Study 2, Chapter 4), the latter hypothesised relationship is explored in the context of exercise goals and outcomes at the global and contextual levels of generality (Vallerand, 1997). While the antecedents of extrinsic and intrinsic exercise goal pursuit have not been directly explored in the literature, and represent a significant avenue for future research this is beyond the scope of the present thesis. Attention is paid to this line of inquiry in the General Discussion (Chapter 7).

1.4.10 Distinguishing between Goal Content (“What”) and Behavioural Regulation (“Why”)

The two main components of SDT presented in this chapter pertain to the content (i.e., the “what”) and behavioural regulation (i.e., the “why”) of goal pursuit. Both concepts share the construct of basic psychological needs as a theoretical commonality. It is asserted within SDT that despite being expected to co-vary to some extent due to this common basis, the “what” and the “why” are conceptually separated and empirically distinguishable (Deci & Ryan, 2000; Sheldon et al., 2004). These assertions have been challenged in the literature by various researchers who contend that the relationships identified between intrinsic and extrinsic goals and well-being are completely reducible to the autonomous and controlled behavioural regulations that accompany these types of goals respectively (Carver & Baird, 1998; Srivastava, Locke, & Bartol, 2001). However, Sheldon et al. (2004) identified three fundamental limitations of this work. First, that the evidence presented by Carver and Baird (1998) actually supports the contentions made in SDT of independence of goal content and behavioural regulation despite the two constructs displaying the hypothesised covariance. Second, that Srivastava et al. (2001) employed a single-item measure of financial success aspirations but a 51-item measure of behavioural regulation. Third, that Srivastava et al.’s measure of behavioural regulation was confounded with items which more closely assessed goal content. Sheldon et al. (2004) subsequently thoroughly investigated the independence of the effects of goal content and behavioural regulation on well-being in a series of three studies. Using within- and between-person methodologies, Sheldon et al. operationalised goal content as imagined intrinsic and extrinsic goal pursuit and actual self-reported goals linked to intrinsic or extrinsic possible futures, and measured well-being using

hypothetical happiness, and change in an aggregate of life satisfaction and positive and negative affect over a 1-year follow-up. In all three studies, consistent with their hypothesis, relative extrinsic goal content was negatively associated with relative autonomous behavioural regulation respectively but the magnitude of the relationships (approximate $r = -.23$) did not suggest redundancy between the two variables. After controlling for the degree of autonomy with which goals were pursued, relative extrinsic goal content significantly predicted variance in well-being outcomes thus supporting the hypotheses of independence of the predictive effects of “what” and “why” with regards to psychological well-being.

In their goal framing studies, Vansteenkiste et al. (2004) extended the findings of Sheldon et al. (2004) beyond the well-being context by testing whether the effect of their goal framing procedures on learning, performance and persistence outcomes was mediated by the participants’ autonomous behavioural regulation for the learning tasks. It was found that autonomous behavioural regulation largely mediated the effect of goal framing in 6 of 11 cases (including outcomes of behavioural persistence, deep learning and test performance) and mediated the effect in the remaining five cases to a smaller extent. It seems possible therefore that the independent effects of goal content and behavioural regulation may hold for some types of variables, and in some contexts and not others (Vansteenkiste, Soenens et al., 2008).

Examining the associations between exercise goal content and cognitive, affective and behavioural outcomes is a central purpose of the research presented in the present thesis. However there is currently no questionnaire that is aligned with the theoretical tenets of SDT with which researchers can assess intrinsic and extrinsic exercise goals. Existing questionnaires that have been used to assess exercise goal content such as the Exercise Motivations Inventory (Markland & Ingledew, 1997), the Reasons for Exercise Inventory (Silberstein, Striegel-Moore, Timko, & Rodin, 1988), and the Motivations for Physical Activity Measure (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997) do not achieve conceptual clarity between goal content and behavioural regulation. Such short-comings limit the accurate empirical examination of the effects of exercise goal content on cognitive, affective and behavioural outcomes and testing of whether these effects are mediated by behavioural regulation.

To address the limitations of previous research and facilitate the theoretically aligned study of exercise goal content, the aim of the studies presented in Chapter 3 of the present thesis is to develop and validate a measure of individual differences in exercise goal content aligned with the theoretical propositions of SDT. Commensurate with the development of a measure that strives to achieve conceptual clarity, the distinction between exercise-based goal content and behavioural regulation within the exercise context is thoroughly discussed in Chapter 3. This distinction is further addressed and empirically tested in the exercise domain employing a variety of outcome variables in Chapter 4 and is more directly tested with regards to behavioural outcomes using objective markers of exercise engagement and a prospective study design in Chapter 6.

1.5 Conclusion

The aim of this General Introduction was to provide the theoretical background and sound justification for the examination of motivation for exercise from the goal content perspective forwarded within SDT. First, key concepts such as motivation and goals were introduced, defined and discussed thereby delineating the precise focus of the present thesis. Second, a strong case for the study of exercise motivation was presented based on evidence pointing towards the health benefits of exercise in addition to the large discrepancy between recent physical activity participation statistics and the English Governments participation targets. Third, SDT was introduced as the guiding framework of the thesis, discussed and supported with empirical evidence. Particular attention was given to the theoretical underpinnings of goal content research and evidence pertaining to the cognitive, affective and behavioural correlates of intrinsic and extrinsic goal pursuit as well as the mechanistic role of psychological need satisfaction in the relationships proposed in the SDT framework. In addition, research pertaining to the antecedents to the pursuit of goals with intrinsic and extrinsic content was presented to bring together the body of work concerning the content of goals from the SDT perspective.

1.6 Overview of the Programme of Research

The purpose of the four empirical chapters was to use SDT to examine the premise that “all goals are not created equal” (Ryan, Sheldon, Kasser, & Deci, 1996, p. 7) within the context of exercise. In particular, the measurement of exercise-based intrinsic and extrinsic goal content was addressed and the implications of pursuing such goals for cognitive, affective, phenomenological and behavioural components of exercise were examined. This line of work was pursued because while there is a body of work concerning the measurement and testing of aspirations at the general life aspiration level, it is unclear whether findings from this research and the hypotheses of SDT with regards to goal content extend to contextual goals such as those for exercise. As exercise has been forwarded as a health enhancing behaviour and people’s goals are a common starting point for understanding their motivation for exercise, extending the SDT perspective on goal content to the exercise domain may be a promising avenue of research. Currently there is no method with which to measure the content of goals for exercise as defined within SDT. As such, previous work assessing the correlates of different exercise goals does not answer important theoretical questions derived from SDT such as whether different goals satisfy psychological needs to differing degrees. In addition, as it is clear that goals such as appearance improvement and social recognition are a pervasive foci of exercise for many people and in many promotion campaigns it is important to understand the consequences and experiences of such goal pursuit so interventions or health promotion can be focused towards developing strategies to foster adaptive motivation for exercise. Such strategies should be evidence based. Therefore, it is the aim of the investigations within this thesis to establish a foundation of evidence with regards to the effects of differential exercise goal pursuit and develop tools with which further research can be conducted.

Continuing from the General Introduction, in Chapter 2, key methodological considerations pertinent to the present thesis were discussed. Specifically, complimenting the studies presented in Chapters 3 and 4 the advantages and challenges of internet data collection were considered. Further, with regards to the methodological techniques used in the studies presented in Chapters 4 and 6 issues pertaining to the measurement of exercise behaviour were presented.

Chapters 3, 4, 5 and 6 comprised four independent and logically sequenced original empirical investigations, each presented as a self-contained research paper. In Chapter 3 the conceptual distinction between goal content and behavioural regulation (Deci & Ryan, 2000; Sheldon et al., 2004) and the current lack of a theoretically-aligned measure of goal content in the exercise context were addressed. In order to extend the work of Kasser and Ryan (1993; 1996) to the study of intrinsic and extrinsic goal pursuit in the exercise domain it was necessary to develop and validate a measure of individual differences in exercise goal content aligned with the theoretical propositions of SDT. This questionnaire development was undertaken in a series of four empirical studies presented in Chapter 3.

The study reported in Chapter 4 employed the questionnaire developed in Chapter 3 to explore the cognitive, affective and behavioural correlates of intrinsic relative to extrinsic exercise goal pursuit. The theoretically hypothesised mediating role of psychological need satisfaction proposed to account for the adaptive correlates of relative intrinsic goal pursuit was also examined in Chapter 4. In addition, the independent effects of relative intrinsic goal content and relative autonomous behavioural regulation were also explored in line with the work of Sheldon et al. (2004). As the results of the investigation presented in Chapter 4 highlighted largely adaptive correlates of relative intrinsic exercise goal pursuit, Chapter 5 comprised a qualitative exploration of the phenomenological experience of exercise by those pursuing relatively strong intrinsic and extrinsic goals. Interpretative analysis of the qualitative data allowed exploration of previously proposed mediating mechanisms (Kasser, 2002; Vansteenkiste, Soenens et al., 2008) and the discovery of person-centred exercise-specific phenomenological concomitants of relative intrinsic and extrinsic goal pursuit.

As the final empirical chapter, in Chapter 6 inference was drawn from the previous chapters and a more advanced study design (i.e., a prospective study over 16 days) and measurement techniques (i.e., objective behavioural assessment) were used to investigate whether relative intrinsic goal content predict exercise behaviour. In addition it was examined whether any observed relationship between relative intrinsic goal pursuit and exercise behaviour occurred independently of the hypothesised relationship between relative autonomous behavioural regulation and exercise behaviour.

In the closing chapter (Chapter 7), the findings from the four empirical chapters were drawn together and discussed in light of previous literature. Limitations of the research were considered in line with directions for future research that build upon the work presented in this thesis and advance the evidence base pertaining to the effects of intrinsic and extrinsic goals from the SDT perspective.

1.7 Footnote

¹ 1 MET is equal to resting energy expenditure ($\approx 3.5 \text{ mL O}_2 \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$).

1.8 References

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CHAPTER 2

Methodological Considerations

Methodological Considerations

2.1 Introduction

As chapters 3 to 6 of the present thesis comprise a logical series of original research studies in the format of peer-reviewed manuscripts it is important to discuss and expand upon methodological considerations which transcend multiple empirical chapters. To this end, with the aim of providing sound justification for the methodology employed, design issues, Internet data collection and the measurement of exercise behaviour are discussed herein.

2.2 DESIGN ISSUES

A primary purpose of the present work was to conduct a series of logically ordered investigations which, after starting from a foundation of accurate measurement of goal content would lead to a sequential building of evidence pertaining to the correlates and experiences of divergent exercise goal pursuit in adults.

The study of motivation for exercise in adult samples is aligned with calls for research related to health promotion and obesity prevention to not neglect adult populations (Seidell, Nooyens, & Visscher, 2005). Undergraduate student populations would have provided a convenient participant pool; however individuals in this stage of development and transition may not have developed exercise goals as fully as may be developed in post-graduation adult samples. Further, a common limitation of much work concerning exercise motivation (including research from the SDT perspective) is that findings cannot be generalised to adult populations beyond the undergraduate sample studied. Selection criteria for all studies required participants to be at least 18 years or older, non-undergraduates and free of mental and physical disability and chronic diseases that would impede their ability to exercise freely. Studies 3 and 4 had more focused selection criteria. In the qualitative Study 3 participants were required to hold exercise goals that represented an imbalance of intrinsic or extrinsic goal as measured by the GCEQ. Finally, in Study 4 participants were required to exercise at least once per week on average so that questions pertaining to their exercise motivation reflected their ongoing experiences. Further details pertaining to the participants in each study are located in the Methods sections of each study.

As Study 1 aimed at developing and validating a questionnaire to measure intrinsic and extrinsic exercise goals large samples were necessary to achieve appropriate statistical power for the required exploratory and confirmatory factor analysis (see section 3.5) in addition to an individual validation sample. Online methodology was used as this facilitated large sample data collection. Data collection was halted once sufficient sample size was achieved for each separate analysis.

Following the development of the GCEQ in Study 1 and given the dearth of evidence in the extant literature pertaining to the correlates of divergent exercise goal pursuit, cross-sectional methodology was appropriate in Study 2. The use of cross-sectional methodology represents an important component part of research concerning SDT, and such methodology has provided much evidence pertaining to the hypotheses forwarded within the theory on which more advanced experimental and intervention studies can be based (Chatzisarantis & Hagger 2007). Cross-sectional online data collection was efficient and ensured a sufficiently broad coverage of a range of cognitive, affective and behavioural outcome variables in addition to psychological mediators. Similar to Study 1, the sample size for Study 2 was dictated by issues pertaining to statistical power. Specifically, the requirements of achieving an over-identified structural equation model and gaining a sufficient number of participants per estimated parameter in phase two of the analysis were considered.

Owing to the findings of Study 2 and adhering to the logical progression of the investigations, in Study 3 it was appropriate to explore in more detail the divergent experiences of exercisers pursuing relative intrinsic or relative extrinsic goals. With this in mind, a qualitative, phenomenological approach was adopted and participants were purposefully sampled in line with the recommendations of the Interpretative Phenomenological Analysis (Smith, Jarman & Osborn, 1999) framework (see section 5.2.4). This sampling strategy ensured that all participants had experience of the phenomenon of interest (i.e., pursuing relative intrinsic or relative extrinsic goals). Section 5.2.3 covers issues pertaining to the appropriateness of qualitative methodology in the in study of goal content.

Building on the findings of Study 2, Study 4 advanced previous analysis of the independent effects of relative intrinsic goal content and relative autonomous behavioural regulation on behavioural outcomes. In doing so, as Study 2 used cross-sectional methodology and self-report behavioural indices, in Study 4, prospective design and objective behavioural measures (see section 2.4) were employed. Goal

content and behavioural regulation were measured one week before behavioural assessment started. In addition, behaviour was assessed objectively over seven consecutive days. Such a prospective design achieved a temporal ordering of the variables of interest adding strength to the causal structure tested in the mediation analysis. As in Studies 1 and 2, the sample size for Study 4 was based upon achieving adequate statistical power within the planned regression analyses.

2.3 INTERNET DATA COLLECTION

Advances in the accessibility and flexibility of information technology and online resources have exposed a number of innovative options for data collection in scientific research. Such developments, coupled with increasing access to the World Wide Web (Office for National Statistics, 2007), have made the online administration of psychological studies using cross-sectional, longitudinal and experimental methodologies common practice (Birnbaum, 2004; Kraut et al., 2004; Pettit, 2002; Robins, Trzesniewski, Tracy, Gosling, & Potter, 2002). For example, a Web site dedicated to Internet-based psychological research conducted in the United Kingdom catalogues over 200 active online studies, encompassing fields of study such as cognitive, educational, health, developmental and social psychology (Gardner, 2008). Further, investigations adopting Internet methodologies are published by peer-reviewed journals; between 2003 and 2004, 21% of American Psychological Association (APA) affiliated journals published Web-based research (Skitka & Sargis, 2006).

Given the intuitive appeal and rising prevalence of Web-based research, there is a growing body of literature aimed at facilitating the critical appraisal and analysis of the advantages and challenges faced in online research. In addition, guidance on both technical and methodological best practice is available (see Birnbaum, 2004; Dillman, 2007), allowing researchers conducting online research to optimise technological advances and maintain scientific rigor in line with academic bodies (e.g., APA; Kraut et al., 2004).

Online questionnaire methodology presents a number of advantages (Sue & Ritter, 2007). First, large heterogeneous samples (e.g., other than university students) can be accessed readily. Second, given advances in the dexterity of Web-based graphics, online questionnaires can be presented in a format identical to the original

questionnaire as intended by the authors. Third, online questionnaire techniques are cost and time effective (subsequent to initial outlay in Web development) (Rhodes, Bowie, & Hergenrather, 2003). Finally, online questionnaires reduce, or in some instances eliminate data entry associated with traditional questionnaire methods as responses are stored on an electronic database and then transferred to a statistical software package for analysis. As such, error associated with human imputation of data is eliminated. In addition, standardised and constrained response formats (e.g., reminders to complete missing items) reduce inaccuracies threatened by missing or illegible data.

Aligned with previous methodologies (e.g., Lonsdale, Hodge, & Rose, 2006; Rhodes et al., 2003) in Studies 1 and 2 (Chapters 3 and 4), participants completing the online questionnaires were: (a) prompted when an item was left unanswered, (b) unable to proceed to subsequent items unless all previous items were answered, (c) faced with upper limits on variables (e.g., age) so as to reduce spurious data and (d) prevented from submitting partially completed questionnaires. Empirical findings support the effectiveness of these techniques in attaining more complete data. For example, Truell, Bartlett, and Alexander (2002) identified that respondents to an online questionnaire completed significantly more items (i.e., 16%) than those completing the same questionnaire in traditional (i.e., paper and pencil) format.

Despite the aforementioned advantages, Internet-based data collection via online questionnaires poses a number of challenges pertaining to the reliability and validity of data (Buchanan & Smith, 1999; Duffy, 2002; Kraut et al., 2004). Such challenges include issues pertaining to: (a) sampling; (b) multiple submissions and non-serious responses; (c) privacy, confidentiality, and informed consent and (d) the psychometric properties of traditional versus online questionnaires. The subsequent section highlights these challenges and their management in Studies 1 and 2 (Chapters 3 and 4).

2.3.1 Sampling

A potential limitation to online research is sampling bias (Kraut et al., 2004). Specifically, questions have been raised as to whether samples elicited through the Internet are unrepresentative as they are more likely to be young, male and educationally and socially advantaged (Buchanan & Smith, 1999). However, Gosling, Vazire, Srivastava, and John (2004) provide evidence showing that Internet derived self-selecting samples are more diverse than traditionally recruited research

participants in the field of personality and social psychology with respect to gender, age and socio-economic status and are equally ethnically diverse. These authors suggested, however, that racial disparities in Internet access results in a large proportion of White online questionnaire respondents. Table 2.1 shows the distribution of different ethnic groups in the four samples studied in Studies 1 and 2 of the present thesis and equivalent data pertaining to national, regional and local (Bath and North East Somerset) populations. It is clear that, in line with Gosling et al.'s (2004) observation, the majority of participants were White, although this is comparable with local and national trends. In some studies greater ethnic diversity was achieved.

In addition to biases due to Internet access, biases within the participant pool may occur due to self-selection, drop-out and response rate within online research (Kraut et al., 2004). For example, individuals may only consider participation if they are interested in the content of the research, or those that drop-out may differ in certain characteristics to those who complete the research. However, it can be argued that in the context of a one-shot cross-sectional study in which participation is voluntary, that these biases may not be significantly different to those encountered when using traditional questionnaire methodology (Gosling et al., 2004). In addition, online research allows researchers to address the inherent biases encountered when sampling from an undergraduate student population. Consistent with the recommendations of Sue and Ritter (2007) and Dillman (2007), measures were taken to reduce drop-out. These included: (a) clear colour-coordinated presentation of the questionnaires to facilitate reading and answering; (b) easy-to-follow, logical and consistent ordering and presentation of Web pages; (c) simple and clear instructions; (d) a predicted completion time and (e) an indication of progress through the questionnaire.

Table 2.1

*Ethnic Diversity of Samples from the Online Studies Conducted in the Present Thesis
Compared with that of National and Local Populations*

	BANES	South West Region	England	Study 1 (Chapter 3)			Study 2 (Chapter 4)
				Study 1	Study 2	Study 3	
White	95.0	96.1	89.1	91.0	90.7	97.8	97.5
Mixed	1.3	1.0	1.6	1.1	0.6	0.6	0.7
Asian	1.3	1.3	5.3	1.4	0.6	0.0	0.0
Black	0.9	0.8	2.7	0.3	0.9	0.6	0.9
Chinese/ Other Ethnic Group	1.5	0.8	1.3	6.2	7.2	1.0	0.9

Note. Units are percentages. BANES = Bath and North East Somerset. Local, regional and national statistics are from National Statistics Online (www.statistics.gov.uk) and are correct as of 2005.

With regards to response rate, a recent study within the field of sport psychology identified no significant difference between online and postal questionnaire response rates (Lonsdale et al., 2006). These authors also identified that the questionnaire response time and proportion of missing data was significantly lower in the online sample. Corroborating these findings, Truell et al. (2002) identified no difference in response rate between posted and online questionnaires, and a significantly faster response speed of online questionnaires compared to posted questionnaires.

A large proportion of personality and social psychology research is conducted using samples of university students (Gosling et al., 2004). As such, a virtue of online research is increased accessibility to non-student samples. Recruitment via an invitational email containing a URL to the online questionnaire is time efficient and simple, facilitating access to samples that may be more representative of a general adult population than university students (Birnbaum, 2004; Rhodes et al., 2003).

The purpose of employing Internet methodology in Studies 1 and 2 was to facilitate effective data collection from a self-selected sample not entirely comprised of university students rather than access to a probability-based random sample of the United Kingdom population. This methodology is supported when the aim of the research is not to canvas the opinion of a nation for example (Kraut et al., 2004; Sue & Ritter, 2007). As recommended by Birnbaum (2004), in Studies 1 and 2 participants were recruited from university communities (research-postgraduates, academic- and administrative employees only), local government councils and local businesses. Owing to issues surrounding data protection and commensurate with Birnbaum's recommendations, a "gatekeeper" distributed a recruitment email containing a URL to the study Web site to employees (Birnbaum, 2004). In line with guidelines forwarded by Dillman (2007), to prevent free access to the Web site by any Internet user (e.g., someone who might enter the terms "exercise motivation" into a search engine) the data-collection Web site was password protected. As such, only those invited to participate by the email distributed by the gatekeeper could access the Web site containing the questionnaires.

2.3.2 Multiple Submissions and Non-serious Responses

A threat to the integrity of data gained via online questionnaires but less common with traditional methods is that of multiple submissions. A common cause of multiple submission is when on completion of the questionnaire, participants click the "back" button on their Web-browser and submit the completed questionnaire for a second time by then navigating forward (at times with altered answers) (Birnbaum, 2004). In Studies 1 and 2, Web site coding disabled the "back" button during completion of the questionnaire, thus preventing such complications. To submit multiple responses, a participant would be required to complete the entire questionnaire on multiple occasions. In addition, as recommended by Birnbaum (2004), to reduce the risk of multiple submissions, participants were not offered incentives (e.g., entry into a prize draw for each submission) to complete the questionnaire on multiple occasions.

Online and traditional questionnaires alike rely upon participants providing serious responses. However, the problem of non-serious responses may be particularly pertinent to online methods owing to increased anonymity and uncontrolled settings in which responses are given. In an investigation of the integrity of Internet-derived data, in which independent samples completed online and traditional personality

questionnaires, Pettit (2002) showed no significant differences between the two methodologies with respect to both non-responses and random, extreme and acquiescent responding. Encouragingly, online methods produced fewer errors in the data set than paper and pencil format in Pettit's study.

2.3.3 Privacy, Security, Confidentiality and Informed Consent

As with all Internet interactions, some risk is posed to an individual's privacy when completing online questionnaires. In the context of Studies 1 and 2, one threat to privacy/security exists during data transit where hacking programs can be used to fraudulently collect data when questionnaires are submitted by the participant to the database. To minimise this threat, a secure server was used to encrypt information sent between the participants' computer and the data collection server. Further, no personally identifiable information was elicited within the questionnaires and all questionnaire responses were numerically coded in the database to ensure that any fraudulently accessed data were anonymous to the perpetrator.

To address ethical issues of confidentiality and informed consent, participants were presented with two Web pages. The first page presented the study information including the context, purpose and nature of the study, and an estimated completion time. Individuals were then asked to proceed to the next page if they were interested in participating. The second page contained information pertaining to informed consent and confidentiality followed by an informed consent statement. As recommended by Granello and Wheaton (2004), participants were required to check a box indicating their participatory consent or close their Web-browser to cease participation. Supporting the use of such an approach to obtain informed consent, Varnhagen et al. (2005) reported that factors central to informed consent (i.e., reading time and information recall) gained online did not differ substantially to consent gained via paper presentation. On completion of the questionnaires participants were presented with a paragraph of text debriefing them as to the purpose of the study.

2.3.4 Psychometric Properties of Traditional versus Online Questionnaires

The increased use of online questionnaires in psychological research has raised questions regarding the psychometric properties of online versions of questionnaires that were developed and validated from scores gained using paper and pencil methodologies (Gosling et al., 2004). A number of studies have addressed this question. For example Buchanan and Smith (1999) compared pencil-and-paper and online versions of Snyder's Self-monitoring Scale and found the psychometric

properties (i.e., factor structure, pattern of loadings, factor means and reliability) of these two forms of the questionnaire to be largely equivalent and in some instances (i.e., factor structure) superior in the online version. Further, in a comparison of results between traditional and online versions of three psychological questionnaires, Pettit (2002) identified that mean and internal consistency statistics did not differ between methods. Finally, using more robust multigroup confirmatory factor analysis techniques, Lonsdale et al. (2006) observed that the factor structure of the Athlete Burnout Questionnaire (Raedeke & Smith, 2001) was invariant between online and postal questionnaire groups confirming previous findings.

2.3.5 Internet Data Collection Summary

In summary, online questionnaire methodology presents many advantages for the cross-sectional Studies 1 and 2. In addition, these methods challenge researchers to consider technological and innovative strategies to overcome obstacles inherent in Internet data collection and maintain scientific rigor. The evidence presented in this section supports the use of online questionnaires to facilitate data collection. Accordingly, such methodology appears warranted and advantageous in the present thesis.

2.4 MEASUREMENT OF EXERCISE BEHAVIOUR

An important aim of Studies 2 and 4 (Chapters 4 and 6) is to determine the utility of the SDT-based goal content construct in predicting criterion variables representing participation in exercise behaviour. As such, in this section, methodological factors pertaining to the measurement and quantification of exercise behaviour are considered, with a particular focus on employing the most appropriate methodology for the research question posed in each study.

Exercise was forwarded in Chapter 1 as a sub-component of physical activity that is more “planned, structured, repetitive, and purposive” (Caspersen, Powell, & Christenson, 1985, p.128). While this definition is upheld when quantifying behaviour in Studies 2 and 4, in the present discussion it is useful to align with the activity measurement literature and use the term *physical activity* when referring to methodological issues pertaining to the measurement of behaviour. Indeed, many measurement tools (particularly instruments which facilitate more objective quantification of behaviour) do not directly distinguish between physical activity and

exercise, rather the researcher must impose empirically derived constraints, filters or thresholds on the data collected based on volume, intensity and duration dimensions to distinguish more purposeful and structured bouts of physical activity indicative of exercise. Although extensive reviews (e.g., Cooper, 2003; Dale, Welk, & Matthews, 2002; Pettee, Storti, Ainsworth, & Kriska, 2009) have appraised different methods for assessing physical activity (e.g., doubly-labelled water, indirect calorimetry, observation, pedometry, accelerometry, heart rate monitoring and self-report) as self-report and accelerometry are employed in Studies 2 and 4 (Chapters 4 and 6) respectively, this review will focus on these two forms of assessment.

2.5 Self-report Questionnaires

2.5.1 Advantages of Self-report Questionnaires

Self-reports are the most frequently used method of assessing physical activity and are gathered through a range of techniques such as recall questionnaires, activity logs/diaries, quantitative history questionnaires and global self-report questionnaires (Valanou, Bamia, & Trichopoulou, 2006). A number of characteristics of self-report questionnaires make such methods advantageous. For example, self-report questionnaires are: (a) cost effective; (b) likely to cause low participant and administrator burden; (c) feasible for use in large-sample research; (d) time efficient; (e) protective against monitor wearing reactivity and (f) are able to capture dimensions of physical activity such as mode, frequency, duration and intensity (Dale et al., 2002; Matthews, 2002; Sallis & Saelens, 2000) although, apart from mode, estimates of the other dimensions are commonly inaccurate. In addition, scores can be converted into a standardised metric reflecting the energy cost of physical activities reported (i.e., Metabolic Equivalents; METs¹). These advantages in addition to the lack of instrumentation located in the middle of the spectrum between self-report and doubly-labelled water until recently may be responsible for the almost exclusive use of self-report questionnaires to assess exercise in previous SDT-based studies.

2.5.2 Limitations of Self-report Questionnaires

In addition to the clear advantages, some limitations of self-report physical activity questionnaires are well documented (Matthews, 2002; Sallis & Saelens, 2000). Such limitations generally pertain to the reliability and validity of scores derived from self-report physical activity questionnaires and sources of error which

may mask the true score. Matthews (2002) highlights that sources of error are commonly partitioned into systematic variation (e.g., reporting biases, issues pertaining to content validity, differences in ability to accurately recall activities of different intensity and inter-personal characteristics such as gender and body composition) and random error (e.g., behavioural error such as intraindividual variation and analytical error such as inconsistent data recording).

With regards to reporting biases, it is clear that self-report techniques assess the perception of physical activity but do not capture actual behaviour. Further, gender, body composition and the intensity of the activity being recalled have been shown to moderate the accuracy of physical activity recall (Klesges et al., 1990). Specifically, Klesges et al. asked 44 adult participants to participate in self-selected physical activities for 60 minutes while this was covertly observed and recorded three times per minute. Following this session participants were asked to recall the minutes they spent in activity ranging in intensity from “stationary” to “fast trunk movement.” Even with the very small time delay between activity participation and recall, Klesges et al. (1990) identified a systematic underestimation of time spent stationary activity and an overestimation of time spent in more vigorous activity. Additionally, males significantly overestimated activity levels relative to females, and obese participants underestimated- while non-obese participants overestimated their physical activity in the 60 minute period. Such findings bring into question the accuracy of activity recalls, especially over longer periods of time than that studied by Klesges et al. (1990) (e.g., a recall of physical activity performed in a week). Further, Duncan, Sydeman, Perri, Limacher, and Martin (2001) identified a tendency for sedentary adults to overestimate time spent in moderate and hard intensity physical activity when comparing 1-day self-logged physical activity with concurrently-recorded heart-rate-monitor data. The finding reported by Duncan et al. (2001) highlights a commonly identified challenge in the use of self-report questionnaires; that a given activity performed at the same objective intensity may be subjectively perceived differently by individuals with varying levels of fitness. As such, it is important that questionnaires achieve appropriate content validity and domain clarity when defining physical activities of various intensity (e.g., light, moderate and vigorous).

A further potential source of systematic error stems from an over-reporting of physical activity owing to socially desirable responding (Sallis & Saelens, 2000). Social desirability is “the need for subjects to obtain approval by responding in a

culturally appropriate and acceptable manner” (Crowne & Marlowe, 1960, p. 353). As being perceived as inactive can confer a number of negative social image- and personality-based evaluations (Martin, Sinden, & Flemming, 2000), it is logical to hypothesise that individuals may over-report their physical activity levels. The findings of Duncan et al. (2001) that suggest sedentary individuals may report greater participation in physical activity than what is objectively assessed could also provide indirect evidence that physical activity self-reports could be contaminated with systematic error owing to social desirability. However, evidence from empirical research provides mixed support for this hypothesis. For example, in a sample of 81 females, Adams et al. (2005) found that social desirability scores were associated with an overestimation of physical activity energy expenditure (calculated as the difference between self-administered 7-day physical activity recall and concurrently assessed energy expenditure derived from doubly-labelled water) and the duration of moderate physical activity (calculated as the difference between self-administered 7-day recall physical activity and concurrently assessed accelerometry data). In contrast, in a study using Godin and Shephard’s (1985) Leisure Time Exercise Questionnaire (LTEQ), Motl, McAuley, and DiStefano (2005) found non-significant or only small correlations (e.g., $r = 0.11$) between LTEQ scores and scores representing social desirability in a sample of 782 college students.

Random error, such as intraindividual variation (i.e., the degree to which an individual’s physical activity varies over a period such as a calendar year) may introduce additional “noise” into the signal when quantifying physical activity using both self-reported and objective assessments (Baranowski & de Moor, 2000; Matthews, 2002; Mattocks et al., 2007). A method forwarded to control for such error is to calculate an intraclass correlation (ICC) from multiple assessments of activity over time (i.e., one assessment in each of the four yearly seasons) and use this to adjust for intraindividual variation in physical activity within statistical analyses (Mattocks et al., 2007). In the present thesis however, this approach was not used owing to time constraints within the programme of research preventing repeated activity assessment. Many self-report questionnaires require participants to recall their activity over a number of days rather than a single day which may go some way to accommodate daily intraindividual variation. In addition, self-report questionnaires using a shorter recall period (e.g., 7-days) show relatively high test-retest reliabilities (Sallis & Saelens, 2000).

2.5.3 The Leisure Time Exercise Questionnaire

The LTEQ (Godin & Shephard, 1985) (Appendix 4.3) was used in Study 2 (Chapter 4) to assess exercise participation. The LTEQ is a self-administered 7-day retrospective recall questionnaire which assesses the frequency of participation in mild (e.g., easy walking), moderate (e.g., easy cycling or fast walking) and strenuous (e.g., running or basketball) exercise for bouts greater than 15 minutes in length during leisure time. Raw data is converted into a MET-time coefficient by multiplying the reported frequency of participation in mild, moderate and strenuous exercise by 3, 5 and 9 METs respectively. The use of the LTEQ is appropriate in instances where a low burden assessment of exercise is necessary and numerous SDT-based studies have previously employed the LTEQ to quantify exercise behaviour (e.g., Edmunds, Ntoumanis, & Duda, 2006; McDonough & Crocker, 2007; Wilson, Rodgers, Blanchard, & Gessell, 2003; Wilson, Rodgers, Fraser, & Murray, 2004).

By providing examples of the exercise intensities as detailed above, the authors of the LTEQ address issues of content validity, facilitate the consistent interpretation of exercise intensities and reduce the risk of misinterpretation. Scores from the LTEQ also demonstrate criterion validity through moderate correlations (range; $r = 0.32$ to 0.45) with accelerometer data (Godin & Shephard, 1985; Jacobs, Ainsworth, Hartman, & Leon, 1993; Miller, Freedson, & Kline, 1994). In these studies, the accelerometer-based criterion variable reflected total METs rather than using activity count thresholds to differentiate time spent in activity of different intensities. Such general quantification of a behavioural criterion may dilute observed relationships compared to instances in which evidence for criterion validity may be obtained by correlating the partitioned LTEQ dimensions (i.e., mild, moderate and strenuous) and accelerometer-derived time spent in physical activity of comparable intensities.

2.5.4 Summary of Self-report Questionnaires

Notwithstanding the evidence pertaining to the biasing of true physical activity scores by the potential sources of error highlighted, a number of researchers acknowledge the need to select a method of physical activity assessment which is appropriate for the given research question (Montoye, Kemper, Saris, & Washburn, 1996). From this perspective, the decision to use self-report methods must be based on the balance of pragmatism on one hand and accuracy on the other. The use of both self-reported and objective estimates of exercise behaviour in the present thesis is

indicative of the decision making processes carried out in light of the requirements of Studies 2 and 4 (Chapters 4 and 6), their logical progression, logistical constraints and financial resources.

2.6 Objective Behavioural Assessment using Accelerometry

A large proportion of existing literature concerning the prediction of exercise and/or physical activity behaviour from SDT-based variables has employed subjective assessment of behavioural outcomes. As such, there is a dearth of SDT-based research employing means of objectively quantifying exercise behavioural engagement. Given the popularity of the SDT framework in the study of health/exercise behaviours and recent calls for such SDT-based research to employ more objective measures (Edmunds et al., 2006; Standage & Vallerand, 2008), it is surprising that, to date, components of SDT have rarely been used to predict objectively assessed dimensions of physical activity. In past work, pedometers have been used to assess steps taken in a single childrens' physical education (PE) class (Lonsdale, Sabiston, Raedeke, Ha, & Sum, in press), and steps taken by children over four days (Vierling, Standage, & Treasure, 2007). Jaakola, Liukkonen, Laakso, and Ommundsen (2008) employed heart-rate monitoring to assess time spent in heart rate categories reflecting light, moderate, vigorous and heavy exercise during a single PE class of adolescents, and Standage, Sebire, and Loney (2008) used the Actiheart (Cambridge Neurotechnology Ltd) device (i.e., concurrent minute-by-minute measurement of acceleration and heart-rate data) to quantify duration of participation in moderate and vigorous bouts of exercise over seven days in an undergraduate student cohort. To the best of the author's knowledge, there is currently no published research which has used SDT-based constructs to predict objectively assessed exercise and/or physical activity in non-student adult populations.

In the field of exercise psychology and specifically the field of motivation, quantifying exercise behaviour using more objective techniques affords researchers greater confidence in the relationships identified between motivational antecedents and behavioural criterion variables. As such, Study 4 (Chapter 6) aimed to build upon the findings of Study 2 (Chapter 4) by examining the motivational sequence from exercise goal content through exercise behavioural regulation to exercise behaviour. Owing to the findings and limitations of Study 2 it was deemed appropriate in Study 4

to gather data using a prospective design and newly available objective behavioural assessment techniques (i.e., ActiGraph accelerometers). Employing an objective measure of exercise behaviour represents an advancement of current SDT-based exercise motivation research in adults which has exclusively previously relied upon self-reported assessments of exercise behaviour variables. In Study 4, exercise behaviour was assessed primarily using accelerometry, which was supplemented by data from a concurrently completed physical activity log.

2.6.1 Accelerometry Overview

Accelerometers are small portable units that, when attached to the body non-invasively measure acceleration and deceleration caused by bodily movement. The magnitude of acceleration is proportional to the intensity of the activity that produced it, such that, in general, more vigorous activities will elicit greater acceleration than less vigorous activities (Chen & Bassett, 2005). The raw output provided by accelerometers are called “counts” (see Chen & Bassett, 2005 for a technical overview), which are presented to the user as a sum of counts over a defined period of measurement (e.g., 10, 30, or 60 second epochs).

Accelerometers are a cost effective and practical alternative to other objective methods of estimating physical activity or energy expenditure such as doubly-labelled water and portable indirect calorimetry while also maintaining objectivity and providing meaningful data concerning the dimensions of physical activity/exercise such as frequency, duration and intensity. While doubly-labelled water is a gold-standard for measuring free-living energy expenditure, such methods do not permit the quantification of duration of participation in activities of different intensity, information which is central to exercise motivation research. The use of accelerometers also represents advancement over pedometer-based research which, although providing an estimate of behaviour via the number of steps per day, fails to differentiate between activities of different intensity.

Moreover, by objectively measuring motion/activity during waking hours, accelerometers overcome a number of issues pertaining to recall biases and misinterpretation of activity intensities associated with more subjective techniques (Cooper, 2003). In addition, using accelerometers in a field which relies on questionnaire inventories for the measurement of most constructs may reduce common method variance; a source of systematic error where observed relationships between scores may be influenced by the similarity of measurement methods rather

than the constructs represented by the measures (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

Despite the promise that accelerometry holds for the quantification of exercise behaviour, such methods are not without limitations. Chen and Basset (2005) highlight that accelerometers fail to detect arm movement, vertical work (i.e., climbing stairs), energy expended pushing or pulling objects, additional energy expended during ambulation while carrying a load, non-weight bearing exercise, aquatic activities (i.e., swimming), very high intensity vertical motion such as that generated during fast running where the acceleration is no longer linear and horizontal acceleration such as that generated in tennis. Notwithstanding these limitations, accelerometers are used extensively in contemporary epidemiology studies (e.g., Matthews et al., 2008; Mattocks et al., 2008) and intervention research (e.g., Keyserling et al., 2002), resulting in a rich literature attempting to establish methodological best practice (e.g., Matthews, 2005). While some aspects of accelerometry methodology are largely well accepted in this literature (e.g., accelerometer placement), Masse et al. (2005) observe that best practice is not yet standardised with regards to the reduction of accelerometer data (i.e., the conversion of raw accelerometer counts to meaningful representations of behaviour). As such, Masse et al. (2005) recommend proceeding with current recommendations. Much literature exists highlighting the methodological issues that require careful consideration including; (a) choice of accelerometer model, (b) validity of accelerometer-derived physical activity data, (c) positioning of the monitor, (d) epoch length, (e) the number of days of assessment required, (f) minimal wear requirements needed to define a “valid day”, (g) identifying missing data (i.e., continuous “zero counts”) and (h) calibration of accelerometer data to facilitate quantification of activity performed at certain intensities. These issues are considered in turn below and are summarised in Table 2.2.

Table 2.2

Accelerometer-based Methodological Considerations and Methods Employed in Study 4

Methodological Consideration	Method employed in Study 4 (Chapter 6)
Model of accelerometer	ActiGraph GT1M
Accelerometer placement location [†]	Mid-line of right hip (secured to a nylon belt)
Epoch length	1 minute
Number of days assessment	7 days
Definition of a “valid day”	80% of a standard day* combined with diary analysis
Missing data (continuous zero counts)	31 sequential minutes of continuous zeros were ignored as missing data. Activity logs were analysed to confirm non-wear or prolonged stillness.
Minimum number of valid days required for retention in study	5 days
Calibration of accelerometer data	MVPA = $\geq 1952 \text{ counts} \cdot \text{min}^{-1}$ (Freedson equation)

Note. [†] see Figure 2.1. * A standard day is the time in which 70% of the sample wore the accelerometer. MVPA = moderate-to-vigorous physical activity.

2.6.2 *Supplementing Accelerometer Scores with Physical Activity Log Data*

A well accepted limitation of uniaxial accelerometry is the inability to: (a) accurately record activities which increase energy expenditure despite not resulting in substantial vertical accelerations of the centre of mass such as cycling, rowing or resistance training and (b) record aquatic activities performed when wearing the accelerometer is not permitted such as swimming or water sports (Welk, 2002). In addition, by examining accelerometer data alone it is problematic, especially in adult populations who may have sedentary employment, determining whether periods of continuous zero counts are indicative of time where the participant did not wear the accelerometer or are reflective of the participant being totally still. This is important

because a threshold is used pertaining to the number of continuous zero counts (that may be indicative of non-wear) that should be excluded from analysis, when calculating the number of minutes of data recorded in a day (see Section 2.5.8). These complexities have ramifications for biasing a sample by excluding participants who swim or cycle and determining participant retention by excluding participants who spend large periods of time inactive while wearing the accelerometer and therefore appear to have less “valid data.”

To address these limitations, a number of authors recommend or report the use of activity logs to concurrently collect additional data during accelerometer assessment (Murphy, 2009; Pettee et al., 2009; Sherar, Esliger, Baxter-Jones, & Tremblay, 2007; Trost, McIver, & Pate, 2005). This data source is then used as a triangulation point with the accelerometer data. In accordance with these recommendations, in Study 4 participants were provided with an activity log (Appendix 2.1) and were asked to record each day: (a) the time that they put the accelerometer on in the morning and took it off at night, (b) when they removed the accelerometer (and put it back on) during waking hours and what they were doing during this time (e.g., swimming or playing a contact sport) and (c) the main activities that they performed each day (active and inactive). When recording their main daily activities, participants were asked to indicate the duration, a description and the perceived intensity of the activity (e.g., light, moderate or vigorous).

During data analysis, activity log data was used as a triangulation point for two objectives: (a) to determine whether days with a total of minutes of recorded data less than the “valid day” requirements were reflective of non-wear or periods of complete sedentarism (see Section 2.5.7) and (b) to determine time spent in activities that were not recorded accurately by the accelerometer so as to create an activity-log-adjusted moderate-to-vigorous physical activity variable.

With regards to the second objective, individual activity logs were scanned for reports of participation in activities that are known to be poorly measured by uniaxial accelerometry (e.g., cycling, rowing or resistance training). Visual inspection of the graphical accelerometer data (e.g., Appendix 2.2) confirmed whether each potentially unmeasured activity was actually unmeasured.² Where an activity was unmeasured, minutes of MVPA were added to the “activity log adjusted MVPA” variable using reported duration and perceived intensity data.

2.6.3 *Model of Accelerometer and the Reliability and Validity of Accelerometer Scores*

In line with the suggestions of Ward, Evenson, Vaughn, Rodgers, and Troiano (2005), the reliability, practicality, cost, data storage capacity and possible participant burden were considered when selecting an appropriate accelerometer. The ActiGraph GT1M accelerometer (ActiGraph LLC, Pensacola, FL) was used in Study 4. The ActiGraph GT1M (Figure 2.1) measures 3.8 x 3.7 x 1.8 cm and weighs 27g.

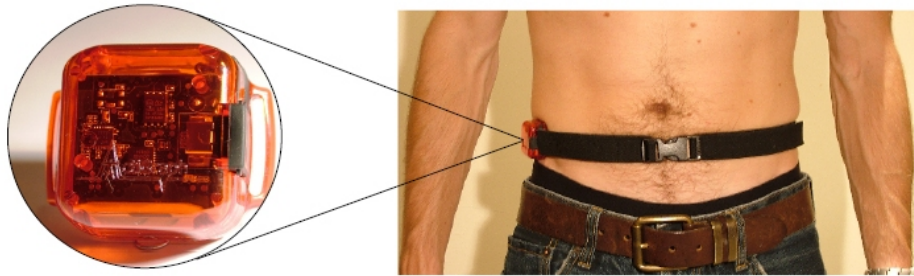


Figure 2.1 The ActiGraph GT1M accelerometer and device placement.

The device contains an integrated chip (IC) configuration to measure acceleration rather than a cantilever beam configuration which was common in previous generations of accelerometer. Time varying accelerations in the vertical plane cause the seismic mass within the monitor to impart tension or compression on a piezo-electric element. This results in the production of a voltage signal which is proportional to the acceleration (Chen & Bassett, 2005). Acceleration ranging from 0.05 to 2.0g is measured and stored on the non-volatile memory. This acceleration range is used to detect normal human movement while filtering out motion from other sources. Acceleration (quantified as “counts”) is summed over user-defined epochs, stored in the internal memory of the unit, and then downloaded to a computer via a USB interface.

The ActiGraph (formally named the CSA accelerometer and MTI accelerometer) is the most widely validated commercially available accelerometer (Plasqui & Westerterp, 2007). Within accelerometry, reliability refers to the consistency of scores derived from the accelerometer and can depend on sources of biological (e.g., fluctuations in an individual’s activity levels) and technical (e.g., inter-instrument) variation (Bassett & Fitzhugh, 2009). Validity of physical activity

measures (including accelerometry) generally refers to the soundness of the measure, most specific and relevant to physical activity are concepts of logical, concurrent and criterion-referenced validity (Bassett & Fitzhugh, 2009).

In a series of mechanical tests, Brage, Brage, Wederkopp and Froberg (2003) provide evidence supporting the intra-instrument reliability and validity of the ActiGraph accelerometer within a range of accelerations typical in human walking and running. Inter-instrument reliability was lower than intra-instrument reliability and the authors therefore recommended using the serial number of each individual accelerometer as a covariate in statistical analysis to control for this variation. In addition, Welk, Schaben, and Morrow (2004) showed the CSA accelerometer to display greater reliability than three other accelerometers during a standardised treadmill walking protocol.

Evidence for the criterion validity and reliability of ActiGraph accelerometer-derived scores further supports use of the ActiGraph in adult populations (see Trost et al., 2005). For example, in a field-based study, Hendelman, Miller, Bagget, Debold, and Freedson (2000) asked participants to walk at four different speeds on an indoor track, play golf and perform a routine of household activities while wearing a CSA, a TriTrac (3-dimensional) accelerometer and a pedometer while energy expenditure was measured using a portable metabolic system. CSA-derived accelerometer counts were correlated with observed METs for walking activities ($r = 0.77$) and all activities ($r = 0.59$). A strong correlation ($r = 0.93$) was identified between data derived from the CSA and TriTrac monitors. In addition, in a review of studies analysing the criterion validity of accelerometer scores, Plasqui and Westerterp (2007) show that ActiGraph/CSA accelerometer counts and doubly-labelled water-derived energy expenditure are repeatedly found to be significantly correlated (mean r from studies of adults = .42). These data provide support for the reliability and validity of the scores derived from the ActiGraph accelerometer.

2.6.4 Monitor Placement

Past work documents the placement of accelerometers on hip, lower back and wrist locations (Ward et al., 2005). The effect of monitor placement on accelerometer output was reviewed by Trost et al. (2005) who concluded that placement of the unit on the trunk (i.e., hip or lower back) is most appropriate (see Figure 2.1). Ward et al. (2005) forwarded the same recommendation and highlighted the importance of providing a standardised protocol (i.e., that all participants wear the monitor on the

same hip in a consistent position throughout the study protocol). The participants in Study 4 were instructed to wear the accelerometer above their right hip (in line with the vertical seam of their right trouser leg). During the laboratory visit, the researcher fitted the accelerometer and belt around each participant's waist and adjusted the fit of the belt with the participant to ensure comfort and correct positioning of the accelerometer. Participants were also provided with a document outlining correct positioning and use of the accelerometer (Appendix 2.3).

2.6.5 Epoch Length

Another consideration when using accelerometers to determine time spent in activity of different intensities is defining the epoch length (i.e., the time over which acceleration data is recorded and summed). Too short an epoch (e.g., 1 to 5 seconds) may provide an unnecessary volume of data largely representing activity which is of low physiological value (Chen & Bassett, 2005), whereas too long an epoch (e.g., 60 to 120 seconds) may obscure more spontaneous changes in movement, essentially smoothing data by averaging higher intensity movement with lower intensity movement that occur within the same epoch (Chen & Bassett, 2005; Reilly et al., 2008). Typically, 1-minute epochs have been used in accelerometer calibration studies, although shorter epochs may be required to capture the time-varying spontaneous activity of children (Trost et al., 2005). Trost et al. (2005) highlight that while the effect of epoch length on accelerometer output has not been systematically studied in adults, 1-minute epochs are likely to be appropriate given adults likely lower incidence of spontaneous physical activity and where time spent in moderate-to-vigorous intensity physical activity is of interest. In addition, Reilly (2008) suggest that because smoothing effects are likely to be small in magnitude and in the worst case misclassify vigorous exercise as moderate, quantifying accelerometry data by combining moderate and vigorous activity may be a practical solution to any possible smoothing effect of longer epochs.

2.6.6 Number of Days of Accelerometer Monitoring

A similar methodological consideration which has received more research attention in adult samples refers to the number of days of accelerometer data that are sufficient to reflect an individual's usual level of activity. This consideration is primarily focused on accounting for the sources of variance in physical activity (e.g., day-to-day variation) and also reflects a desire to balance accuracy (i.e., gathering reliable data) against efficiency (i.e., gathering sufficient data within time and

financial constraints) and participant compliance (i.e., using a protocol which will achieve protocol adherence). Trost et al. (2005) reviewed four studies aimed at ascertaining the number of days of accelerometer monitoring required to obtain reliable physical activity data in adults. Findings from the studies reviewed showed that data collected over three to six days could provide reliable estimates of physical activity (i.e., an ICC of 0.80). In addition, the results of a large-sample study using the CSA accelerometer sampling at 1-minute epochs in an adult population, suggest that activity measured over seven days increases reliability to ICC = 0.90 for activity counts and variables representing moderate and moderate-to-vigorous activity in both males and females (Matthews, Ainsworth, Thompson, & Bassett, 2002). In Study 4, seven days of accelerometer data were collected. However, it is not reasonable to expect that all participants will exhibit perfect compliance to the monitoring protocol. In addition, given the evidence forwarded by Trost et al. (2005) that between 3-6 days of data can produce reliable estimates of physical activity in adults, it would seem unnecessary to exclude participants for whom reliable accelerometry data is available. To this end, five valid days (see Section 2.5.7) of accelerometer data was used as the lower bound required for inclusion in Study 4.

2.6.7 Definition of a “Valid Day”

Central to the decision pertaining to the minimum number of days' data collected (or analysed) is the definition of what constitutes a “valid day.” A valid day is defined by the minimum number of hours (or minutes) or proportion of the monitoring period on which data was collected (Masse et al., 2005). This methodological decision also addresses some issues pertaining to missing data (see Section 2.5.8). A number of thresholds for defining a valid day have been forwarded including those based on: (a) hours of data recorded (e.g., 8, 10, or 12hrs), (b) a percentage of waking time (e.g., 60%) estimated by activity logs completed concurrently and (c) a percentage (e.g., 80%) of a standard day (defined as the length of time that 70% of the sample wore the accelerometer) (Catellier et al., 2005; Masse et al., 2005). In Study 4 the latter rule (labelled the “70/80 rule”) was employed to determine the minimum number of minutes required to define a “valid day.” To calculate the “standard-day” using the 70/80 rule, the *on-time* (i.e., when the accelerometer is put on after waking), and *off-time* (i.e., when the accelerometer is removed before sleep) are required. These data can be gathered either by activity log report or accurately from the raw accelerometry data. By accounting for the time of

day at which each participant puts the accelerometer on after waking and removes it before sleep, the 70/80 rule accounts for intra-individual and intra-day variability in sleeping patterns (i.e., differences between weekend and weekday “wake times”) (Masse et al., 2005). Figure 2.2 presents an adapted worked example taken from Catellier et al. (2005) illustrating how the minimum number of hours (or minutes) required to classify a “valid day” was calculated in Study 4 using the 70/80 rule. The final definition of a day as valid was made using evidence from the 70/80 rule and the activity log (see Section 2.5.2).

2.6.8 *Missing Data and Continuous Zeros*

Related to the issue of defining a “valid day” (e.g., minimum number of minutes of accelerometer data recorded), researchers must decide on how to handle occasions where continuous zero counts occur in the accelerometer data and when these segments are considered as missing data (Masse et al., 2005). Continuous zeros may occur for a number of reasons; such as removal of the instrument (e.g., for showering), being totally still (e.g., sitting working at a desk or playing a computer game), napping or sleeping during the day or device malfunction. It is therefore difficult to determine if a participant is inactive, has removed the accelerometer or has a faulty device and thus has missing data (Masse et al., 2005). Appendix 2.2 shows a graphical illustration of two days’ accelerometer data from one participant annotated with detail from the activity log. It is evident that there were substantial periods of time where the participant was wearing the accelerometer but was recording zero counts.

At present there are no formal age-specific recommendations for how many sequential zero counts can be tolerated in the data before data is considered missing (i.e., reflective of non-wear), although it is recommended that a larger value (e.g., 20 minutes of continuous zeros) should be used in adult relative to child populations owing to their more sedentary lifestyle (e.g, office-based jobs) (Masse et al., 2005). Some recent studies have used thresholds as high as 60 minutes of continuous zero counts (allowing for up to two minutes of interruption) (e.g., Troiano et al., 2008). Ward et al. (2005) advise caution when employing automatic data cleaning using a threshold of continuous zero counts and suggest that researchers should “attend to data points that are outside a range of plausibility” (p. S587).

Weekday

Minimum number of hours of non-missing data for a “valid weekday”:

$$0.80 * (70^{\text{th}} \text{ percentile } \textit{off-time} - \textit{on-time})$$

$$70^{\text{th}} \text{ percentile of weekday } \textit{on-time} = 08:00$$

$$70^{\text{th}} \text{ percentile of weekday } \textit{off-time} = 23:26$$

$$= 0.80 * (23:26 - 08:00)$$

$$= 0.80 * (15.26)$$

$$= 12.21 \text{ hours or } 732 \text{ minutes}$$

Weekend day

Minimum number of hours of non-missing data for a “valid weekend day”:

$$0.80 * (70^{\text{th}} \text{ percentile } \textit{off-time} - \textit{on-time})$$

$$70^{\text{th}} \text{ percentile of weekend day } \textit{on-time} = 09:51$$

$$70^{\text{th}} \text{ percentile of weekend day } \textit{off-time} = 23:36$$

$$0.80 * (23:36 - 09:51)$$

$$= 0.80 * (13.85)$$

$$= 11.08 \text{ hours or } 665 \text{ minutes}$$

Figure 2.2 Worked example of the 70/80 rule for defining a valid weekday and weekend day of accelerometer data in Study 4 (adapted from Catellier et al., 2005).

In Study 4, to facilitate a logical data handling approach, participants were asked to record in their activity log, times at which they removed the accelerometer, forgot to-, or chose not to wear it. This information largely eliminates speculation upon the nature of any continuous zeros in the data and thus facilitates the identification of actual “missing data.” Using this data, commensurate with the recommendations of Ward et al. (2005) and owing to the age (i.e., adult) and largely sedentary occupations of the participants in Study 4, analysis was conducted to

determine a plausible length of continuous zero counts ≥ 20 minutes that occur when the participants reported wearing the accelerometer in their activity log. Daily minute-by-minute accelerometer data and activity log data from a randomly selected sample of 20 participants were analysed. Results indicated an average length of a sequence of continuous zeros ≥ 20 minutes of 31.35 minutes. Within the analysis of accelerometer data distributional complications caused by missing data are avoided through the use of summary activity scores (e.g., average minutes per day spent in moderate-to-vigorous intensity activity) calculated from the raw minute-by-minute data.

2.6.9 Calibration of Accelerometer Data

A final but important consideration refers to using thresholds of activity counts to facilitate the extraction of data reflective of time spent engaging in activities of light, moderate and vigorous intensity. Such thresholds are useful as they enable the partitioning of physical activity into meaningful intensity-based categories (Freedson, Melanson, & Sirard, 1998).

Thresholds refer to specific activity intensities most commonly quantified by the number of accelerometry counts per minute. Such thresholds are derived from linear regression equations predicting energy expenditure measured via oxygen consumption from concurrently assessed accelerometry counts in calibration studies (Matthews, 2005). Matthews (2005) lists eight regression equations and derived thresholds that have been formulated using the ActiGraph in adult samples. These guidelines differ in their specification of threshold values owing to the activities that were performed during calibration (e.g., treadmill ambulation vs. activities of daily living) and the setting in which calibration took place (e.g., laboratory vs. field) (Chen & Bassett, 2005). For example, Freedson et al. (1998) derived their threshold values from studying adults walking and running ranging from light to vigorous intensity whereas the thresholds derived by Swartz et al. (2000) were based on activities of daily living which were at their maximum, moderate in intensity.

There are no formal guidelines regarding the use of one calibration equation over another although it is recognised that using one calibration approach will misclassify the intensity of certain activities (Troiano & Berrigan, 2008). Specifically, accelerometer count thresholds from calibration equations derived from walking and running may underestimate the energy cost of light-intensity activity (e.g., housework and outdoor chores), whereas thresholds based on calibration equations derived from

activities of daily living may overestimate the energy cost of ambulatory activities (see Welk, 2002 for a review).

In Study 4 the count thresholds derived from the Freedson equation (Freedson et al., 1998) were used. Using this equation, count thresholds for activities of different intensities are as follows; light ($\text{METs} \leq 2.99$) = $<1952 \text{ counts} \cdot \text{min}^{-1}$, moderate ($\text{METs} = 3.00 \text{ to } 5.99$) = $1952 \text{ to } 5724 \text{ counts} \cdot \text{min}^{-1}$, hard ($\text{METs} = 6.00 \text{ to } 8.99$) = $5725 \text{ to } 9498 \text{ counts} \cdot \text{min}^{-1}$, very hard ($\text{METs} = 6.00 \text{ to } 8.99$) = $> 9498 \text{ counts} \cdot \text{min}^{-1}$. It is common for the “hard” and “very hard” thresholds to be combined into a category reflecting “vigorous” activity (Matthews, 2005). Although no single equation can account for all activities experienced in daily life (Welk, 2002), the thresholds developed by Freedson et al. (1998) were used in Study 4 for a number of reasons. Firstly, the equation was calculated based on data from 35 male and female adult participants compared to other equations based on data from small samples of male participants only. As such, the thresholds are likely to generalise to other adult samples. Secondly, the Freedson equation was derived using data from walking and running activities rather than activities of daily living (e.g., simulated housework). Given that ambulatory activities are measured most accurately by accelerometers and such activities are likely to account for a large proportion of most people’s leisure-time activity (Welk, 2002), employing accelerometer count thresholds based upon similar activities is logical (Troiano & Berrigan, 2008). Thirdly, previous research has shown energy expenditure estimates derived from the Freedson equation to correlate more strongly with energy expenditure measured using doubly-labelled water techniques than seven other ActiGraph-based regression equations (Leenders, Sherman, & Nagaraja, 2006) and provide the closest estimates of time spent in light and moderate physical activity (Crouter, Churilla, & Bassett, 2006). Crouter et al. (2006) found that although all 15 of the equations tested underestimated time spent in vigorous physical activity, the underestimation by the Freedson equation was among the smallest.

2.6.10 Limitations of Objective Behavioural Assessment

Although the use of objective methods of physical activity assessment presents many advantages over self-report methodology, objective methods such as accelerometry also present their unique limitations (Dale, Welk, & Matthews, 2002). Firstly, accelerometers and their associated software and hardware are expensive to purchase and therefore in many cases prohibit the collection of data from large

samples. Second, accelerometers cannot assess some behaviours (e.g., swimming) and inaccurately assess many others such as those which are composed of: (a) mainly upper-body movement (e.g., weight lifting), (b) horizontal rather than vertical acceleration (e.g., cycling or rowing) and (c) weight-bearing activities / activities on a gradient (i.e., carrying a load or climbing stairs). A third limitation of accelerometers is that the calibration equations that are used to derive cut points from the accelerometer data are often derived from activities that either represent activities of daily living (e.g., raking leaves) or treadmill based running and walking. Therefore for investigations in which accurately measuring exercise behaviours in adults is a priority, no field based accelerometer cut-points derived from a range of exercise modes are available to accurately estimate time spent in exercise in those who perform activities other than running and walking. Finally, the quality of the accelerometer data relies very much on the participants' correct use of the device. For example it is difficult to know whether the accelerometers are placed in the correct position / orientation away from controlled laboratory settings. Despite these limitations and the challenges they pose for researchers, the objective measurement of physical activity remains advantageous over more subjective methods and an exciting area of future research in the field of SDT.

2.6.11 Summary of Measurement of Exercise Behaviour

In this section, considerations pertinent to self-report and accelerometry-based methods of physical activity assessment were presented. While it is clear that no single measurement technique is free of limitations and that both self-report and accelerometry are subject to sources of error, the use of self-report and accelerometry in Studies 2 and 4 respectively responds to the demands of the specific research question in hand. The use of these methods is aligned with recommendations of the methodological literature and, in the case of Study 4, advances SDT-based exercise motivation research in adults.

2.7 Conclusion

Collectively, this chapter has presented a discussion of two key methodological issues related to the present thesis; Internet data collection and the subjective and objective measurement of exercise behaviour. Firstly, by considering a number of challenges and potential pitfalls and supporting empirical data, Internet

data collection methods were shown to be advantageous and appropriate for use in the cross-sectional questionnaire-based Studies 1 and 2 (Chapters 3 and 4). Secondly, the advantages, limitations and methodological considerations pertaining to both self-reported and objectively assessed exercise behaviours were discussed. Self-report measurement was deemed appropriate given the aims and magnitude of Study 2. In addition, accelerometry was forwarded as being an appropriate means of quantifying exercise behaviour in Study 4, as it aimed to build upon the findings of Study 2 and extend SDT-based research in the exercise context.

2.8 Footnotes

¹1 MET is equal to resting energy expenditure ($\approx 3.5 \text{ mL O}_2 \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$).

²For some activities (e.g., cycling) although the vertical acceleration component should be very small (resulting in the misclassification of moderate intensity cycling as light intensity and thus not counting towards a participants MVPA total) there was evidence (from activity log and graphical accelerometer data) that more frequent cyclists recorded less vertical acceleration while cycling than less frequent cyclists. A possible explanation may come from the participants' cycling technique. The more frequent cyclists may maintain more stable hips while cycling and cause less vertical acceleration than the less experienced cyclists. Where the vertical acceleration of an activity such as cycling was recorded at an intensity indicative of moderate intensity exercise (i.e., $>1952 \text{ counts} \cdot \text{min}^{-1}$), data from the activity log was not added to the MVPA variable as this would result in double-counting of these activities.

2.9 References

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CHAPTER 3

Development and Validation of the Goal Content for Exercise Questionnaire

Development and Validation of the Goal Content for Exercise Questionnaire

3.1 Abstract

Self-Determination theory (SDT; Deci & Ryan, 2000) proposes that intrinsic, relative to extrinsic, goal content is a critical predictor of the quality of an individual's behaviour and psychological well-being. Through three studies, we developed and psychometrically tested a measure of intrinsic and extrinsic goal content in the exercise context (viz., Goal Content for Exercise Questionnaire; GCEQ). In adults, exploratory ($N = 354$; Study 1) and confirmatory factor analyses ($N = 312$; Study 2) supported a 20-item solution consisting of 5 lower order factors (i.e., social affiliation, health management, skill development, image and social recognition) which could be subsumed within a 2 factor higher order structure (i.e., intrinsic and extrinsic). Evidence for external validity, temporal stability, gender invariance and internal consistency of the GCEQ was found. An independent sample ($N = 475$; Study 3) provided further support for the lower order structure of the GCEQ and some support for the higher order structure. The GCEQ was supported as a measure of exercise-based goal content which may help understand how intrinsic and extrinsic goals can motivate exercise behaviour.

3.2 Introduction

The past 20 years has seen the emergence of a compelling and consistent body of literature documenting the many positive physiological, psychological and health benefits associated with exercise and physical activity participation (Department of Health, 2004; U.S. Department of Health and Human Services, 1996). Similarly, the World Health Organization (WHO) recognises the role that physical activity and exercise participation can play in facilitating reductions in noncommunicable diseases such as obesity, diabetes mellitus, cardiovascular disease, hypertension and stroke, and some types of cancer (WHO, 2002). From a public health perspective, such evidence underscores the importance of understanding the motivational factors that encourage individuals to become and remain physically active (Standage & Duda, 2004). To this end, while habitual daily physical activity (e.g., having to walk to a shop) may be largely governed by motivational factors distal to those underpinning exercise behaviour, motivation towards structured and purposeful exercise is a worthy line of investigation as such actions are underpinned by exercise-related cognitive processes (Edmunds, Ntoumanis, & Duda, 2006).

Within the context of purposeful exercise, individuals may have a number of different goals in mind. For example, some people may follow an exercise regime to improve their physical health whereas others may work out to enhance their image or appearance in order to look good in the eyes of others. One theoretical framework that has received increasing research attention pertaining to the study of the differential effects of divergent goals is Self-Determination Theory (SDT; Deci & Ryan, 2000; Kasser & Ryan, 1993, 1996; Vansteenkiste, Lens, & Deci, 2006). Within this theoretical framework, the kind of goals that one pursues is said to yield implications for one's personal and relational functioning. Specifically, based on the content of goals, a distinction is made between *intrinsic* and *extrinsic* goals. The aim of the present research was to develop and psychometrically test a questionnaire that assesses the intrinsic and extrinsic goals individuals can pursue when exercising. Such a questionnaire, which achieves conceptual clarity from a SDT perspective, is not currently available in the exercise science literature.

3.2.1 *Intrinsic versus Extrinsic Life Goals*

The initial work on goal content within SDT (Kasser & Ryan, 1993, 1996) focused on people's general life goals. Using an intrinsic versus extrinsic dichotomy to differentiate aspirational (or goal) contents, Kasser and Ryan (1993, 1996) suggested that the content of one's goals are related to cognitive, affective and behavioural outcomes due to their interplay with the satisfaction versus thwarting of three innate psychological needs for autonomy, competence and relatedness (Deci & Ryan, 2000; Ryan & Deci, 2000). Autonomy pertains to feelings of volition or self-determination when enacting an activity (Deci & Ryan, 1985). Competence refers to feelings of effectance within one's environment, bolstered by the mastery of valued outcomes (Deci & Ryan, 2000; White, 1959). Finally, relatedness reflects feelings of affiliation or connection with others within a given social setting (Baumeister & Leary, 1995).

The goals of self-acceptance, affiliation, community contribution and health/fitness are postulated to exist in concordance with the human innate growth tendencies proposed within SDT. That is, such goals are hypothesised to satisfy the psychological needs for autonomy, competence and relatedness (Deci & Ryan, 2000) and are therefore labelled *intrinsic*. In contrast, *extrinsic* life domain goals such as seeking fame, having an appealing appearance and financial success are more outwardly oriented, externally referenced goals (Williams, Cox, Hedberg, & Deci, 2000) that are contingent on the approval or analysis of others. As such, they are hypothesised to be less or even unsatisfying of basic psychological needs and consequently considered to hinder optimal human development (Deci & Ryan, 2000). In line with these conceptualisations, various studies have provided factor-analytical evidence for the differentiation between intrinsic and extrinsic life goals (e.g., Sheldon & Krieger, 2004; Vansteenkiste, Duriez, Simons, & Soenens, 2006). Further studies have found intrinsic and extrinsic goals to be differentially related to basic need satisfaction (e.g., Vansteenkiste, Neyrinck et al., 2007).

It should be noted that the concepts of intrinsic, relative to extrinsic, goal contents ("what" of behaviour) should not be confused with the more often studied SDT-based concepts of autonomous or willing, relative to controlled or pressuring, regulation ("why" of behaviour; Deci & Ryan, 2000). Both sets of constructs have been found to be moderately positively related (e.g., Sheldon et al., 2004), although the strength of these correlations (approximate $r = .30$) were not such that the

construct of intrinsic versus extrinsic goal contents was redundant relative to the earlier introduced concept of autonomous versus controlled regulations, as suggested by some critiques of the goal-content perspective (e.g., Carver & Baird, 1998). Specifically, extrinsic goals have been found to be pursued primarily with a controlled regulation, whereas intrinsic goals are pursued primarily with an autonomous regulation (e.g., Sheldon & Kasser, 1995). These correlations suggest that it is entirely possible that a person exercises to improve his/her health, because their doctor forced them to do so, which represents an instantiation of a controlled regulation of intrinsic goals. Similarly, an extrinsic goal can also be pursued for autonomous reasons, as when a person exercises to look more appealing because he/she highly values being thin. Thus, an important issue that will be addressed in the current study is the examination of the relationship between exercisers' goals (i.e., intrinsic and extrinsic) and behavioural regulations (i.e., autonomous and controlled) for exercising as a means to assess the external validity of the Goal Content for Exercise Questionnaire.

3.2.2 The Correlates of Intrinsic versus Extrinsic Life Goals

Consistent with their presumed different linkage to basic need satisfaction, initial work couched in intrinsic and extrinsic goal content identified positive associations between intrinsic (self-acceptance, affiliation and community feeling), relative to extrinsic (financial success) aspiration importance and well-being (viz., self-actualisation and vitality) and negative associations with anxiety and depression (Kasser & Ryan, 1993). Kasser and Ryan (1996) analysed one further intrinsic (i.e., physical fitness) and two further extrinsic (i.e., social recognition and appealing image) goals in the life domain. Findings pertaining to intrinsic and extrinsic composite goal variables including these new goals corroborated previous findings in that holding high intrinsic, relative to extrinsic, aspiration importance was associated with significantly greater well-being and significantly less depression and physical symptoms. More recent work shows that the adverse effects of pursuing extrinsic goals at the expense of intrinsic goals also emerge for individuals who reside in a social environment that matches with their extrinsic goal pursuits (Kasser & Ahuvia, 2002; Vansteenkiste, Duriez et al., 2006, but see Sagiv & Schwartz, 2000 for contrasting evidence).

Past work has also shown that the pursuit of extrinsic, relative to intrinsic, life goals not only yields implications for one's personal well-being, but also for one's social functioning, as indexed by less cooperation (Sheldon & McGregor, 2000), more

Machiavellianism (McHoskey, 1999) and more intolerance and prejudice (Duriez, Vansteenkiste, Soenens, & De Witte, 2007). In short, prior research on intrinsic, relative to extrinsic, life goals indicates that the content of people's goals matters, but similar research in different life-domains is currently lacking. The present research aimed to begin filling this void by developing a scale that assesses intrinsic and extrinsic exercise goals.

3.2.3 Intrinsic and Extrinsic Exercise Goals

Recent research has provided support for the utility of an intrinsic, relative to extrinsic, goal content approach to understanding variations in an individual's behavioural performance and persistence in exercise settings (for an overview, see Vansteenkiste, Soenens, & Lens, 2007). In this research, goal content was experimentally manipulated. Indeed, intrinsic and extrinsic goals can not only be differentially pursued by exercisers, they can also be promoted to different degrees by exercise instructors and settings. The type of promoted goals might yield implications for individuals residing within these settings. In line with this, Vansteenkiste, Simons, Lens, Sheldon and Deci (2004) found that framing an exercise activity (learning Tae Bo) in the service of extrinsic goal attainment undermined graded performance test scores and behavioural persistence at the exercise compared to an intrinsic goal framing group. Subsequent work (Vansteenkiste, Simons, Soenens, & Lens, 2004) showed that intrinsic goal framing yielded more beneficial effects compared to a no-goal control group, whereas extrinsic goal framing, in contrast, undermined learning and performance compared to the no-goal control group.

Although researchers have manipulated goal content in exercise settings, it has not been possible to accurately assess individual differences in the goals of exercise participants due to a lack of a valid and reliable measure aligned with the theoretical tenets of SDT. Existing questionnaires containing items designed to tap exercise *motives* or *reasons* for exercise are abundant in the literature. These include the Reasons for Exercise Inventory (REI; Silberstein, Striegel-Moore, Timko, & Rodin, 1988), the Revised Motives for Physical Activity Measure (MPAM-R; Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997) and the Exercise Motivations Inventory (EMI-2; Markland & Ingledew, 1997). Although each contains items that could represent intrinsic and extrinsic goals, these instruments are not directly grounded in the SDT-based conceptualisation of intrinsic and extrinsic goal content (Kasser & Ryan, 1993, 1996; Sheldon, Ryan, Deci, & Kasser, 2004). Further, as these

instruments were developed prior to recent theoretical advances in SDT, they fail somewhat to clearly and consistently differentiate between intrinsic and extrinsic goal content and the behavioural regulation of goals underlying the pursuit of particular goal contents (Sheldon et al., 2004), an issue that is now critical from the SDT-perspective (Deci & Ryan, 2000). To illustrate, the EMI-2 contains a scale labelled health pressures, which assesses the extent to which exercisers feel pressure to pursue fitness and health. From the SDT-perspective, this scale is theoretically ambiguous, as it assesses a pressured or controlled regulation of an intrinsic goal, thus confounding the “what” and “why” of behaviour. In addition, all three of the aforementioned instruments tap *enjoyment motives* or *reasons* which represent intrinsic behavioural regulation. Designing a questionnaire that clearly tapped intrinsic and extrinsic exercise goals without contamination of behavioural regulations was an important aim of the present study.

It is also important to note that although exercising might stand in the service of various other goals, not all goals are said to be either intrinsic or extrinsic in nature. This is because the intrinsic-extrinsic goal content differentiation is not meant to be exhaustive to encompass all possible goals (Ryan, Huta & Deci, 2008). For instance, it is difficult to argue a priori whether mood enhancement, which reflects the tendency to exercise to cope with one’s daily stress, and the goal of losing weight through exercising, are explicitly intrinsic or extrinsic in nature. Specifically, the goal of weight loss seems ambiguous, as one might want to lose weight through exercising to reduce the health risk associated with being overweight, in which case the exercise-related weight loss would stand in the service of an intrinsic goal, or to improve one’s appearance, in which case it would be rather extrinsically oriented. Further, when analysing goal content at the domain level, certain goals will be more contextually relevant than others. For instance, power (an extrinsic goal) is likely to be salient in the organisational domain (Vansteenkiste, Neyrinck et al., 2007), however appearance goals may be less so, whereas the opposite is likely to be true for the exercise domain. In addition, goals such as financial success might be relevant to the professional sport domain, but seem irrelevant in the exercise domain. With these issues in mind, (and in line with results of item development procedures undertaken), in the present work we aimed to assess three intrinsic and two extrinsic exercise goals, that is; (a) social affiliation, which represents the goal of forming close/meaningful bonds with others through exercise; (b) health management, which taps the exercise goal of health or

fitness improvement; (c) skill development, which reflects the goal of skill acquisition or development through exercising; (d) image, which refers to the goal of enhancing one's appearance; and (e) social recognition, which refers to the goal of being noticed and admired by others for one's exercising. Whereas the latter two goals reflect a tendency to exercise to attain external signs of worth, within the first three goals, exercising is more focused on the realisation of one's potential and growth.

3.2.4 The Present Research

Based on past empirical research (e.g., Kasser & Ryan, 1993, 1996) and aligned with the goal content (or “what” goals individuals aspire to) facet of SDT (cf. Deci & Ryan, 2000), the present research sought to develop a questionnaire to assess exercise goal content. Three studies were carried out to develop, confirm and test the validity of the Goal Content for Exercise Questionnaire (GCEQ). In Study 1, we developed items and explored the content, factorial composition and structure of the GCEQ items in relation to intrinsic and extrinsic goal content. Building on the findings of our initial work, in Study 2 we sought to confirm the tenability of lower and higher order measurement models for the GCEQ scale as identified in Study 1. Additionally, we sought to test the reliability, aspects of construct validity and gender invariance of scores derived from the scale. Finally, the purpose of Study 3 was to confirm the GCEQ measurement model in a new sample and examine the temporal stability of the scale scores.

3.3 STUDY 1

The purposes of Study 1 were to: (a) develop a pool of items tapping exercise goal content and (b) test their factorial composition via exploratory factor analysis (EFA).

3.4 Method

3.4.1 Participants

The total sample ($N = 666$) comprised 284 males and 382 females ranging in age from 18 to 73 years ($M = 34.42$, $SD = 11.74$). The ethnic diversity of the sample was as follows: White (91.1%), Chinese (2.3%), Indian (2.1%), and Other (4.5%). To allow us to test the factorial validity of the GCEQ, two random samples were drawn from the total sample. Specifically, responses provided by 354 participants were used

to provide an indication of the factorial composition of the GCEQ items, whereas the responses provided by the remaining 312 participants were used in the confirmatory factor analyses (CFA; Study 2) to confirm the theoretically derived measurement model based on the EFA findings. The sample used in the EFA analysis ($N = 354$) comprised 147 males and 207 females ranging in age from 18 to 73 years ($M = 34.40$, $SD = 11.64$). The ethnic diversity of the sample was: White (91.3%), Chinese (2.3%), Indian (2.3%), Other (4.1%).

3.4.2 Procedure

The present study utilised online questionnaire methodology. Following the approval of a local ethics committee and those of five universities in the South West of England, postgraduates and university employees were recruited via an invitational email. Following an introduction to the study, participants were invited to participate by accessing the online questionnaires via a URL embedded in the email. Basic information and estimated questionnaire completion time was presented on the first page of the Website. Participants provided their consent and participation cessation was offered by the invitation to close their Web-browser. Consenting participants were presented with a series of Web-pages containing questionnaire items.

3.4.3 Measure

Aligned with the “what” facet of SDT, an initial pool of items was formulated using a number of techniques to ensure that the resultant questionnaire was theoretically grounded, relevant and meaningful. First, a content analysis of existing questionnaires that included items akin to exercise goals (e.g., EMI-2, MPAM-R, and REI) was conducted. Second, a focus group of graduate students who were known exercisers ($N = 8$) were asked to list “what” exercise goals they pursued (rather than “why” they pursued their goals). This focus group was also asked to provide feedback on the clarity of the items derived from the content analysis. Emergent items were preliminarily screened to ensure their alignment with the goal content rather than the behavioural regulation facet of SDT. Items considered to be ambiguous from a theoretical perspective were retained at this stage for further analysis and/or re-worded to improve clarity. These items were then reviewed by three academic experts (whose primary area of research combined SDT, exercise or sport and the subject of goal content) who were asked to provide feedback on the clarity of each item in terms of assessing exercise-based goal content. Using this feedback, items were revised and adjusted appropriately. These minor modifications resulted in a reduced item pool

which was more representative of goal content (i.e., had greater content validity), with the retained items also discriminating the “what” aspect from the “why” aspect of SDT (i.e., enhanced conceptual clarity).

Following item development, 26 items were selected that were purported to represent a range of lower order (Health management, Skill development, Social affiliation, Social recognition and Image) and higher order (Intrinsic and Extrinsic) themes of exercise goal content. Participants rated each item responding to the stem “please indicate to what extent these goals are important for you while exercising.” Each item was scored on a 7-point likert-type scale ranging from; 1 (*not at all important*) through 4 (*moderately important*) to 7 (*extremely important*).

3.5 Results

An EFA was conducted on the 26 raw items in order to identify underlying factors. The participant to item ratio (14:1) was considered as acceptable (Hair, Black, Babin, Anderson, & Tatham, 2006). As past work has shown intrinsic and extrinsic goals to be positively correlated (e.g., Kasser & Ryan, 1996), in the present work we expected a positive association among the GCEQ goal factors. Accordingly, principal axis factoring was employed using direct oblimin rotation.¹ Factor extraction was based on an eigenvalue magnitude >1.0 and confirmatory examination of the scree plot; such extraction criteria have been previously supported in the statistical literature (Floyd & Widaman, 1995) and have been frequently used within the fields of sport and exercise psychology (Ntoumanis & Vazou, 2005; Wilson, Rogers, Rodgers, & Wild, 2006). With regard to interpreting extracted items, Hair et al. (2006) suggest that items with factor loadings >.50 can be considered as meaningful. As we were striving to retain a psychometrically sound set of items, this more rigorous criteria for item interpretation was used. Additionally, cross-loading items were removed from analysis when the primary loading was >.50 and the secondary loading >.32 (the suggested minimum factor loading required for item meaning) (Tabachnick & Fidell, 2007). Further, and consistent with the recommendations of Tabachnick and Fidell (2007), single item factors were excluded from analysis.

The initial EFA resulted in a solution containing five factors accounting for 62.96% of the variance in the items. Employing the aforementioned criteria in examination of the pattern matrix, we removed two items and performed an additional

EFA to obtain a simple factor structure. This solution comprised five factors accounting for 65.57% of the variance of the 24 remaining items (see Table 3.1). All but four communalities exceeded the recommended .50 level (Hair et al., 2006) however these four items displayed communalities of $> .43$. Therefore, these items were retained for further analysis in subsequent studies due to (a) the exploratory nature of EFA and the purpose of the present study and (b) the small magnitude of the violations.

Analysis of item content suggested that the extracted items could be represented by the hypothesised 5 factors encapsulating goal content for exercise. Factor 1, *Social affiliation* consisted of 6 items tapping the goal of forming close/meaningful bonds with others through exercise (e.g., “To form close bonds with others”). Factor 2, *Image* was represented by 4 items assessing the goal of image or appearance enhancement (e.g., “To improve my appearance”). Factor 3, *Health management* comprised 4 items tapping the exercise goal of health or fitness improvement (e.g., “To improve my overall health”). Factor 4, *Social recognition* comprised 6 items assessing the goal of being noticed and admired by others in an exercise context (e.g., “To be well thought of by others”). Four items comprised the fifth factor, *Skill development* including items assessing the goal of skill acquisition or development (e.g., “To acquire new exercise skills”).

It was hypothesised that factors 1, 3 and 5 represented intrinsic exercise goal content while factors 2 and 4 represented extrinsic exercise goal content. These hypotheses were tested in the next stage of analysis using CFA.

Table 3.1

Item Means, Standard Deviations and Factor Loadings Following Exploratory Factor Analysis

GCEQ Subscale & Item	<i>M</i>	<i>SD</i>	Factor				
			I	II	III	IV	V
Social Affiliation							
To form close bonds with others	2.26	1.40	.91	.01	-.04	-.05	.02
To develop close friendships	2.24	1.51	.84	.01	-.09	-.09	.03
To connect with others in a meaningful manner	2.31	1.44	.73	.04	-.06	-.07	-.12
To share my spare time with a partner and/or friend	2.95	1.88	.71	-.03	.10	.07	-.01
To share my exercise experiences with people that care for me	2.36	1.62	.70	-.03	.12	-.03	-.05
To meet others who share my exercise interests	2.77	1.72	.67	.01	-.05	-.05	-.21
Image							
To improve the look of my overall body shape	4.98	1.65	.00	.93	.03	.05	-.02
To improve my appearance	4.99	1.63	-.03	.87	-.00	.02	-.04
To be slim so to look attractive to others	4.58	1.70	-.02	.75	-.02	-.06	-.03
To change my appearance by altering a specific area of my body	3.57	1.87	.03	.67	.03	-.03	.06
Health Management							
To increase my resistance to illness and disease	5.36	1.43	.11	-.02	.68	.01	.08
To increase my energy level	5.64	1.24	-.07	.05	.65	-.04	-.14
To improve my overall health	6.13	1.04	.03	.12	.64	.07	.06
To improve my endurance, stamina	5.64	1.26	-.15	-.04	.51	-.12	-.31

Continued

Social Recognition

To be well thought of by others	2.24	1.38	.02	.00	.02	-.92	.02
To gain favourable approval from others	2.09	1.43	.03	.04	.03	-.90	.07
To be socially respected by others	2.16	1.39	.04	-.01	-.02	-.87	.03
To impress others	2.09	1.33	-.04	.04	-.11	-.84	-.11
To gain social recognition from others	2.11	1.40	.09	.03	-.02	-.80	.02
So that others recognise me as an exerciser	2.05	1.33	-.03	-.23	.09	-.79	.01

Skill Development

To acquire new exercise skills	3.46	1.86	.05	-.02	.00	.01	-.90
To develop my exercise skills	4.03	1.77	.04	.05	.05	.03	-.78
To become skilled at a certain exercise or activity	3.91	1.89	.13	-.02	-.10	-.06	-.74
To learn and exercise new techniques	3.35	1.75	.09	.00	.09	.03	-.72

			Factor				
Factor Correlations & Internal Consistency			I	II	III	IV	V
I.	Social Affiliation		.91				
II.	Image		.01	.88			
III.	Health Management		.03	.27	.74		
IV.	Social Recognition		-.41	-.27	.00	.90	
V.	Skill Development		-.46	-.02	-.32	.29	.89

Note. Numbers in bold represent primary factor loadings. Cronbach's alpha coefficients are on the principle diagonal of the factor correlation matrix.

3.6 Brief Discussion

The purpose of Study 1 was to develop an initial measure of exercise goal content aligned with the theoretical tenets of SDT. Findings from the EFA supported a 5-factor solution; with factors tapping intrinsic (social affiliation, health management and skill development) and extrinsic (social recognition and image) goals.

3.7 STUDY 2

In Study 2, we sought to use CFA to: (a) confirm the findings of the EFA, (b) further refine the structure of the scale identified in the EFA analysis and (c) assess an a priori higher order measurement model for the GCEQ. Further, we tested the external validity of the scores from the resultant scale by correlating the intrinsic and extrinsic goal scales with exercisers' autonomous and controlled motivation for exercising (Mullan, Markland, & Ingledew, 1997). Although theoretically distinct constructs, intrinsic and extrinsic goals display a tendency to be pursued for autonomous and controlling regulations, respectively (Sheldon et al., 2004). In line with this reasoning and previous work (Sheldon & Kasser, 1995), it was hypothesised within the exercise context that intrinsic goals would be positively correlated with autonomous regulations, whereas extrinsic goals would be positively correlated with controlled regulations. Finally, we sought to gather further preliminary evidence on the external validity of the GCEQ by examining whether the intrinsic and extrinsic goals for exercise were correlated with satisfaction of needs for autonomy, competence and relatedness. It was hypothesised that intrinsic goals would display stronger correlations with need satisfaction than extrinsic goals. We also aimed to examine whether responses to the GCEQ items: (a) were related to an index of social desirability and (b) would be invariant across gender when combined into subscale scores.

3.8 Method

3.8.1 *Participants*

The sample randomly assigned to the CFA analysis ($N = 312$) comprised 137 males and 175 females ranging in age from 19 to 63 years ($M = 34.44$, $SD = 11.88$).

The ethnic diversity of the sample was: White (90.7%), Chinese (2.2%), Indian (1.9%), and Other (5.2%).

3.8.2 Measures

Exercise Goal Content. The 26 original GCEQ items were used in the present analysis. Although EFA suggested the removal of two items, we decided to use the original full set of items to examine whether the proposed removal of the two problematic items in EFA would be confirmed in the CFA.

Psychological Need Satisfaction. The Psychological Need Satisfaction in Exercise scale (PNSE; Wilson et al., 2006) consists of 18 items scored on a 6-point likert-type scale. In the present sample internal consistency (Cronbach's α) for each subscale was as follows; autonomy $\alpha = .93$, competence $\alpha = .92$, relatedness $\alpha = .94$.

Exercise Behavioural Regulation. Participant's autonomous versus controlled exercise regulations were assessed using the Behavioural Regulations in Exercise Questionnaire (BREQ; Mullan et al., 1997). Previously, this scale has demonstrated good psychometric properties in an adult sample (Mullan et al., 1997). In the present sample, the internal consistency scores were as follows; intrinsic motivation $\alpha = .93$, identified regulation $\alpha = .78$, introjected regulation $\alpha = .79$, external regulation $\alpha = .81$. Autonomous motivation ($\alpha = .90$) was represented by a composite score of the intrinsic motivation and identified regulation subscales while controlled motivation ($\alpha = .78$) was represented by a composite score of the introjected regulation and external regulation subscales.

Social Desirability. To assess whether GCEQ responses were subject to socially desirable response styles, the ten-item version of the Marlowe-Crowne Social Desirability Scale (MC2-10; Strahan & Gerbasi, 1972) was employed. This shortened version is recommended for use in scale development research (DeVellis, 1991), and was chosen as it reduces participant burden and the instrument's psychometric properties have been supported in past work (e.g., Strahan & Gerbasi, 1972). On this occasion, the reliability of the MC2-10 was $\alpha = .53$. It is recognised that this alpha coefficient falls short of the conventionally accepted value of $\alpha > .70$ and as such the results should be interpreted with caution. This said, it is reported that although reliability is somewhat reduced, the MC2-10 is useful where it is desirable to reduce participant burden (Strahan & Gerbasi, 1972).

3.8.3 *Data Analysis*

To confirm the findings of the EFA, the 26 GCEQ items were analysed via CFA using AMOS version 7.0 (Arbuckle, 2006). The proposed measurement model, (26 items loading on five first order latent goal factors) was found to be overidentified. In addition to the Chi-square statistic (χ^2) (it is suggested that the Chi-square test is dependent upon sample size; Marsh, Balla & McDonald, 1988) assessment of the adequacy of the GCEQ measurement model was supplemented with the examination of three fit indices. Specifically, in line with the recommendations of Hu and Bentler (1999) the comparative fit index (CFI), standardised root mean square residual (SRMR) and the root mean square error of approximation (RMSEA; including its 90% confidence interval) were employed. Although much debate surrounds the selection of precise thresholds of fit, especially relevant within the field of theory based multi item/factor CFA testing (Markland, 2007; Marsh, Hau, & Wen, 2004), it is commonly accepted that thresholds of $>.90$, close to (or less than) $.08$ (Bentler, 1995) and up to $.08$ (Browne & Cudeck, 1993) for the CFI, SRMR and RMSEA respectively are indicative of acceptable model fit. Excellent fit between the hypothesised model and the data is indicated by thresholds of $>.95$ for the CFI, and close to (or less than) $.08$ and $.06$ for the SRMR and RMSEA, respectively (Hu & Bentler, 1999). In addition we analysed modification indices and standardised residuals to screen for mis-specified items. In line with previous work (e.g., Hagger et al., 2007; Motl & Conroy, 2000) items that displayed large standardised residuals ($> \pm 2.00$) were considered for removal. Further data analysis sought to calculate scale descriptives, reliability estimates and examine external validity (via bivariate correlations).

3.9 Results

3.9.1 *Internal Validity*

Examination of Mardia's Coefficient (131.80, $p < .001$) indicated that the data departed from multivariate normality. In line with recommendations of Byrne (2001), all subsequent CFAs were conducted using maximum likelihood estimation coupled with bootstrapping procedures. In a recent application of bootstrapping procedures to statistical computer programs, Preacher and Hayes (2004) advanced the use of 1000 bootstrap samples. Commensurate with this recommendation and aligned with a

number of extant empirical studies that have used the bootstrapping approach (e.g., Lutz, Karoly, & Okun, 2007; Standage, Duda & Ntoumanis, 2003), in the present work 1000 bootstrap replication samples were drawn with replacement from the data sets. The bootstrapped samples were equal in size to the original sample. With sample size issues in mind, our ratio of just over five participants per estimated parameter was deemed appropriate based on the recommendations of Bentler and Chou (1987).

Results of the CFA suggested a good fit of the model to the data but indicated room for improvement [χ^2 (289) = 750.38, $p < .001$; CFI = .92; SRMR = .06; RMSEA = .07 (90% CI = .07 to .08)]. Supporting the findings of Study 1, modification indices revealed that the two items removed in the EFA analysis again displayed cross-loadings on multiple factors and were associated with multiple standardised residuals $> \pm 2.00$. These items were removed from further analysis. Excluding these items improved the fit of the model to the data [χ^2 (242) = 612.95, $p < .001$; CFI = .93; SRMR = .06; RMSEA = .07 (90% CI = .06 to .08)]. However, within this model two items from the social affiliation factor cross-loaded on the skill development factor. Both items were also associated with multiple standardised residuals $> \pm 2.00$ and as such, were removed from further analysis. In addition, in order to achieve an equal number of items per factor (to aid computation of a relative intrinsic goal score using latent structural equation modelling) the model was respecified by deleting the two lowest loading items from the social recognition factor (these two items were also associated with multiple standardised residuals $> \pm 2.00$). This respecification resulted in a 20-item, perfectly balanced 5-factor model that displayed an excellent fit to the data [χ^2 (160) = 301.14, $p < .001$; CFI = .97; SRMR = .05; RMSEA = .05 (90% CI = .04 to .06)]. Examination of the modification indices and standardised residuals of this solution revealed no further factorially complex items. Table 3.2 displays item means, standard deviations, standardised factor loadings and bootstrap standard errors for this solution.

Table 3.2

CFA Factor Loadings, Item Means, Standard Deviations, Standard Error, Squared Multiple Correlation, Factor Correlations and Internal Consistency

GCEQ Subscale & Item		<i>M</i>	<i>SD</i>	Factor					<i>SE</i>	<i>SMC</i>
				I	II	III	IV	V		
Social Affiliation										
1	To connect with others in a meaningful manner	2.22	1.37	.80					.03	.65
6	To share my exercise experiences with people that care for me	2.21	1.48	.77					.04	.60
11	To develop close friendships	3.45	1.86	.90					.02	.80
16	To form close bonds with others	2.08	1.34	.95					.01	.90
Image										
2	To improve the look of my overall body shape	5.02	1.69		.87				.03	.76
7	To improve my appearance	4.99	1.60		.87				.03	.76
12	To be slim so to look attractive to others	4.49	1.73		.73				.04	.53
17	To change my appearance by altering a specific area of my body	3.67	1.93		.66				.04	.44
Health Management										
3	To increase my resistance to illness and disease	5.69	1.31			.56			.06	.32
8	To increase my energy level	5.71	1.32			.77			.05	.60
13	To improve my overall health	5.21	1.53			.68			.06	.47
18	To improve my endurance, stamina	6.12	1.14			.65			.06	.42

Continued

Social Recognition						
4	To be well thought of by others	2.09	1.32		.92	.02 .36
9	To be socially respected by others	2.04	1.31		.87	.02 .73
14	To gain favourable approval from others	1.96	1.22		.84	.03 .49
19	So that others recognise me as an exerciser	2.02	1.40		.83	.03 .59
Skill Development						
5	To acquire new exercise skills	3.31	1.88		.93	.02 .86
10	To learn and exercise new techniques	3.26	1.74		.87	.02 .76
15	To become skilled at a certain exercise or activity	3.72	1.90		.81	.03 .65
20	To develop my exercise skills	3.89	1.77		.71	.03 .51
<hr/>						
		Factor				
Factor Correlations & Internal Consistency		I	II	III	IV	V
I.	Social Affiliation	.92				
II.	Image	.17	.86			
III.	Health Management	.21	.39	.75		
IV.	Social Recognition	.60	.29	.09	.92	
V.	Skill Development	.51	.19	.38	.41	.90

Note. Numbers to the left of each item represent the item's position in the GCEQ. $N = 312$. CFA = Confirmatory Factor Analysis. SE = Standard Error. SMC = Squared Multiple Correlation. Cronbach's alpha coefficients are on the principle diagonal of the factor correlation matrix. All factor loadings are statistically significant ($p < .05$).

In order to assess the existence of a higher order factor structure of goal content, a higher order measurement model was specified. In this model, the five first order latent goal factors were represented by two higher order latent factors, namely intrinsic (i.e., social affiliation, skill development and health management) and extrinsic goals (i.e., image and social recognition). The fit of the higher order GCEQ measurement model was similar to that of the first order model and displayed excellent fit to the data [$\chi^2(164) = 355.30, p < .001$; CFI = .95; SRMR = .07; RMSEA = .06 (90% CI = .05 to .07)]. The higher order intrinsic factor displayed factor loadings of .85, .29 and .62 with the social affiliation, health management and skill development goal factors respectively. The higher order extrinsic factor displayed factor loadings of .90 and .33 with the social recognition and image goal factors respectively.

3.9.2 *Gender Invariance Analysis*

To examine whether the GCEQ scale displayed invariance across gender, a sequential model testing approach was employed via multi-sample CFA. Specifically, two increasingly constrained models, specified to examine the measurement (i.e., item loadings) and structural parameters (i.e., factor variances and covariances) of the GCEQ were tested for equality across male and female samples. Because it is widely accepted that testing the invariance of error variances and covariances is overly restrictive, this line of inquiry was not pursued. Traditionally, invariance testing has relied on the χ^2 test statistic as an indicator of equality across groups. However, as this test is influenced by sample size, the recommendations of Cheung and Rensvold (2002) were adopted. Accordingly, and commensurate with previous work (e.g., Hagger et al., 2007), a change in $\text{CFI} \leq -.01$ between increasingly more constrained models was considered indicative of invariance. Independent CFA models specified for males, females and an unconstrained model (i.e., baseline) specified using the total sample displayed excellent fit to the data:

Males: $\chi^2(160) = 237.77, p < .001$; CFI = .96; SRMR = .06; RMSEA = .06
(90% CI = .04 to .08)

Females: $\chi^2(160) = 276.26, p < .001$; CFI = .95; SRMR = .06; RMSEA = .07
(90% CI = .05 to .08)

Total sample (males & females): $\chi^2(320) = 514.04, p < .001$; CFI = .95; SRMR = .06; RMSEA = .04 (90% CI = .04 to .05)

In the next step the factor loadings were constrained to be equal across groups, this model yielded excellent fit to the data, [χ^2 (335) = 541.87, $p < .001$; CFI = .95; SRMR = .06; RMSEA = .05 (90% CI = .04 to .05)]. Although the change in χ^2 was significant, $\Delta \chi^2$ (15) = 27.83, $p = .02$, the change in CFI (Δ CFI = .00) supported invariance of the factor loadings across gender. The final model which additionally constrained the factor variances and covariances to be equal across gender maintained an excellent fit to the data, [χ^2 (350) = 561.67, $p < .001$; CFI = .95; SRMR = .07; RMSEA = .04 (90% CI = .04 to .05)]. Further, the χ^2 difference was non-significant $\Delta \chi^2$ (15) = 19.81, $p = .18$ and the change in CFI was $\leq -.01$ (Δ CFI = .00). These analyses provide support for factorial invariance by suggesting the factor loadings and factor variances and covariances of the GCEQ measurement model to be invariant across male and female samples.

3.9.3 Descriptives and Internal Consistencies

Examination of mean scores indicated that the most strongly-endorsed exercise goal was health management ($M = 5.68$, $SD = 1.01$) followed by image ($M = 4.54$, $SD = 1.46$). Skill development was the next most strongly-endorsed goal ($M = 3.54$, $SD = 1.59$) followed by social affiliation ($M = 2.16$, $SD = 1.24$) and social recognition ($M = 2.03$, $SD = 1.18$). This endorsement pattern was identical in rank between males and females; however males ($M = 4.10$, $SD = 1.43$) rated image goals as significantly less important than females ($M = 4.89$, $SD = 1.39$), t (310) = -4.91, $p < .001$. Each subscale of the GCEQ displayed internal consistency reliability estimates (α) of $\geq .75$ (see Table 3.2).

3.9.4 External Validity

Table 3.3 displays evidence for the external validity of the scores derived from the GCEQ. In these analyses health management, skill development and social affiliation goals were averaged to form a composite *intrinsic goal* ($\alpha = .87$), whereas a composite variable labelled *extrinsic goal* ($\alpha = .84$) was computed by averaging image and social recognition goals. Due to the observed correlation between intrinsic and extrinsic composite goal factors ($r = .45$), partial correlations were employed to explore unique relationships of the goal factors, behavioural regulations and psychological needs.

Table 3.3

Partial Correlations between Intrinsic and Extrinsic Goal Contents and Theoretically Related Constructs

	Autonomy		Competence		Relatedness		Autonomous Regulation		Controlled Regulation	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
	5.15	0.93	4.32	1.08	3.06	1.46	3.03	0.78	1.09	0.71
Intrinsic Goals	.01		.43*		.51*		.48*		.02	
Extrinsic Goals	-.02		-.04		.02		-.04		.42*	

Note. * $p < .01$. Bivariate correlation between intrinsic goals and extrinsic goals $r = .45$.

The partial correlations between the intrinsic and extrinsic GCEQ factors and autonomous and controlled behavioural regulation composite scores supported our hypotheses. After removing the shared variance with extrinsic goals, in line with thresholds recommended by Cohen (1992), intrinsic goals were moderately positively correlated with autonomous regulation. In a similar vein, after removing the shared variance with intrinsic goals, extrinsic goals were positively correlated with controlled exercise regulations.

Examination of the partial correlations of intrinsic and extrinsic goals and need satisfaction measures showed a positive partial correlation between the intrinsic goal composite and competence need satisfaction that was moderate to large. The correlation between the intrinsic goal composite and relatedness need satisfaction was positive and large. Partial correlations indicated that extrinsic goals did not associate with satisfaction of any of the three needs. Surprisingly, the intrinsic goal composite did not correlate with autonomy need satisfaction.

There was no evidence to suggest that responses to the GCEQ were affected by social desirability, with each GCEQ subscale displaying non-significant correlations with the MC2-10 score (social affiliation, $r = .03$, $p = .58$; health management, $r = -.04$, $p = .52$; skill development, $r = -.04$, $p = .45$; social recognition, $r = -.04$, $p = .46$, and image, $r = -.06$, $p = .31$).

3.10 Brief Discussion

The factorial validity of the GCEQ was supported using CFA. Specifically, CFA procedures supported the removal of the two items deemed problematic within the EFA analyses of Study 1. Moreover, an excellent fit of the measurement model to the data was obtained following the exclusion of four further items. Twenty items representing five internally consistent goal content factors were retained to form this final solution. Higher order CFA supported previous hypotheses of overarching intrinsic and extrinsic goal factors. Further, multisample CFA suggested that the factor loadings, and factor variances and covariances were invariant across gender.

Examination of correlations between goal contents and theoretically related constructs provided evidence for the external validity of the GCEQ scores. Intrinsic goals were found to be more strongly correlated with the satisfaction of needs for competence and relatedness than extrinsic goals. Intrinsic goals were unrelated to autonomy need satisfaction. We return to this issue in the general discussion. Finally, intrinsic and extrinsic goal composite scores tended to correlate more strongly with autonomous and controlling exercise regulations respectively. These results within the exercise context support previous findings pertaining to the distinctiveness of goal content and the behavioural regulation of goals in the general life domain (e.g., Sheldon et al., 2004).

3.11 STUDY 3

The purpose of Study 3 was to examine the GCEQ measurement model with an independent sample to ensure that our model respecifications did not capitalise on chance. Further, we tested the temporal stability of responses to the GCEQ over a 1-month period.

3.12 Method

3.12.1 *Participants*

For Study 3 an independent sample was recruited. After removing 10 outliers based on GCEQ subscale scores (i.e., 5 univariate outliers displaying standardised scores of $\geq \pm 3$, and 5 multivariate outliers displaying mahalanobis distances ≥ 20.52 , cf. Hair et al., 2006), the sample ($N = 475$) comprised 142 males and 333 females

ranging in age from 20 to 72 years ($M = 42.62$, $SD = 10.54$). The ethnic diversity of the sample was as follows: White (97.2%) and other (2.8%).

3.12.2 Procedure

Having gained the consent of local Government employers located in the South West of England, employees were invited via email to visit the study Website and complete the 20-item version of the GCEQ online as identified in Study 2. The same methodological approach used in Studies 1 and 2 was adopted.

3.13 Results

3.13.1 Internal Validity

The 20-item GCEQ was tested using CFA procedures as outlined in Study 2. As in Study 2, Mardia's coefficient indicated that the data departed from multivariate normality. The participant to estimated parameter ratio was approximately 10:1, meeting recommended thresholds (Bentler & Chou, 1987). Supporting the findings of Study 2, the fit indices revealed a good fit between the GCEQ measurement model and the data [$\chi^2(160) = 452.65$, $p < .001$; CFI = .94; SRMR = .07; RMSEA = .06 (90% CI = .06 to .07)]. In addition, the higher order structure approached a satisfactory fit [$\chi^2(164) = 567.96$, $p < .001$; CFI = .92; SRMR = .11; RMSEA = .07 (90% CI = .07 to .08)]. Examination of modification indices suggested parameter modifications could be made, however these modifications were not pursued as they lacked theoretical justification. That is, we avoided the temptation to make sample specific modifications as such a decision would have represented a data-driven approach (McDonald & Ho, 2002).

3.13.2 Temporal Stability

An independent sample ($N = 110$) comprising 38 male and 72 female university students, ranging in age from 18 to 24 years ($M = 20.24$, $SD = 1.36$) completed the 20-item GCEQ on two occasions separated by one month. Supporting the temporal stability of the GCEQ, intraclass correlations (ICC) for each subscale were as follows; health management, ICC = .79; social affiliation, ICC = .89; skill development, ICC = .80; social recognition, ICC = .85; image, ICC = .89. Further, the intrinsic and extrinsic goal composite scores displayed intraclass correlations of ICC = .83 and ICC = .89 respectively.

3.14 Brief Discussion

Study 3 provided support for the temporal stability of the GCEQ over a one month period as well as for the factorial validity of the GCEQ's lower order structure in independent validation samples. With regard to the higher order structure, while the CFI and RMSEA were indicative of good fit, the SRMR value was marginally higher than Hu and Bentler's (1999) suggested criteria. This said, researchers have been cautioned against using fit index thresholds as "golden rules" by which to judge model fit (Marsh et al., 2004). Indeed it is suggested that such model judgments (especially concerning multifactor instruments) should not be made exclusively on the basis of fit index thresholds (Marsh et al., 2004). Instead, Hu and Bentler (1998) have suggested that other contributory factors such as interpretability of parameter estimates and model complexity need be taken into account in addition to overall fit indices. It is also important to avoid adopting a purely data-driven approach that strives for good model fit (Byrne, 2001; Markland, 2007). To this end, modifications to the GCEQ's higher order structure were not pursued in view of (a) the reliability and temporal stability evidenced in Study 3, (b) the excellent higher-order model fit and external validity of the goal composites identified in Study 2, (c) the conceptual and theoretical underpinning used to develop the measurement scale and (d) that modifications could be sample specific and may result in the premature exclusion of potentially useful items.

3.15 General Discussion

The purpose of the present research was to develop and psychometrically evaluate scores from a questionnaire (GCEQ) that captured the importance placed on exercise goals in light of the intrinsic and extrinsic goal content dichotomy highlighted in SDT (Deci & Ryan, 2000; Kasser & Ryan, 1996). In support of our objectives, a systematic series of studies provided empirical support for the reliability and validity of scores on a measure of exercise-based goal content (that is, the "what" rather than the "why" of exercise motivation). Collectively, the findings from the present research suggest that the GCEQ has the potential to further investigations pertaining to individual differences in exercise motivation by providing researchers with a measure of a theoretically important component of SDT (viz., exercise goal content). Researchers should be careful to use the GCEQ as intended; to measure the "what"

component of individuals' exercise goals, in line with the writings of Deci and Ryan (2000) and their colleagues (e.g., Sheldon et al., 2004).

The factor analyses of Studies 1 and 2 supported a five-factor solution, highlighting exercise goals pertaining to health management, skill development, social affiliation, social recognition and image domains that were invariant across gender. The CFA procedure of Study 2 further suggested that these lower order goals could be appropriately grouped at a higher order level as *intrinsic* (health management, skill development and social affiliation) and *extrinsic* (social recognition and image) goals. Further, results supported the internal consistency of all subscales and responses to the GCEQ were shown to be coherently related to theoretically pertinent variables and unrelated to a measure of social desirability.

Given the evidence presented regarding the GCEQ's external validity being in line with theoretical hypotheses, it would seem that goal content as assessed via the GCEQ can be appropriately located in the nomological network underpinning SDT (Deci & Ryan, 2000) which purports that intrinsic goals will facilitate adaptive outcomes via the satisfaction of basic psychological needs. The present results provide support for this hypothesis in that the more *inwardly* focused intrinsic goals were related to greater psychological need satisfaction (in this case competence and relatedness) than the *outwardly* focused extrinsic goals (Williams et al., 2000). The absence of correlation between the intrinsic goal composite factor and autonomy need satisfaction was surprising, although intrinsic goals were found to be positively related to autonomous exercise regulation. One reason for this null-finding might be due to the way that the concept of autonomy satisfaction was assessed. The items of the PNSE (Wilson et al., 2006) seem to primarily tap the availability of exercise options from which one can decide. While decisional autonomy (Houlfort, Koestner, Joussemet, Nantel-Vivier, & Lokes, 2002) reflects an important subcomponent of autonomy, it is also critical to assess individuals' phenomenological experience of pressure and tension versus volition and psychological freedom, labelled with the term affective autonomy by Houlfort et al. (2002). Intrinsic goal pursuit might be especially critical for the latter, as the pursuit of intrinsic goals would allow one to freely engage in exercise activity even though one might not always be given the opportunity to decide for oneself which activities to engage in. A similar observation has been made by McDonough and Crocker (2007) who employed the PNSE with a sample of adult dragon boat racers. Taken collectively, the findings of the present work and those of

McDonough and Crocker suggest that the autonomy items of the PNSE, while purporting to tap the need for autonomy, may more explicitly assess the perception of choice.

Future work exploring the relationship between exercise goal content and exercise-based autonomy need satisfaction may therefore benefit from using more holistic assessments encompassing different aspects of autonomy (see also Reeve, Nix, & Hamm, 2003 for a similar point). While such advances in measurement may provide clearer results concerning the satisfaction of autonomy, it is important to note that this unexpected finding is also only identified in a single cohort. Thus, sample specific factors in the present data (viz., deviations from normality) may, in part, account for this result.

Further evidence for the external validity of the GCEQ scores was provided through the observation that intrinsic and extrinsic goal contents correlated as hypothesised with autonomous and controlling forms of behavioural regulation. These findings support previous contentions that while being conceptually independent constructs, intrinsic and extrinsic goals tend to be more strongly associated with autonomous and controlling forms of behavioural regulation respectively (Kasser, 2002; Sheldon et al., 2004). In line with previous work in the general life domain which has supported the conceptual distinction between goal content and goal regulation, future work may explore whether goal contents and behavioural regulation yields independent effects on exercise-related affect, cognitions and behaviour.

In Study 3 we used CFA to test the GCEQ's factorial structure in an independent sample. The lower order structure of the GCEQ was supported and support for the higher order model was partially provided. Moreover, the final 20-item, five-factor solution displayed good temporal stability.

While our findings are promising, we acknowledge that the GCEQ may require further development and validation. With this in mind, future research may involve further examination of SDT driven exercise goal content assessment to advance the structure of the GCEQ.

3.15.1 Limitations

A number of limitations to our research warrant discussion. Although the five goal factors examined using the GCEQ represent conceptually and theoretically grounded exercise goals, there exist further exercise goals which require conceptual clarification in light of the SDT goal content perspective. For example, the goal of

weight loss is a pervasive exercise goal that individuals may hold (Lowry et al., 2000), however, weight loss could be pursued equally in order to improve one's appearance in the eyes of others or in order to enhance one's physical health (O'Brien et al., 2007). Future work in this area would do well to further explore the conceptual clarification and differential effects of intrinsic and extrinsic weight loss goal pursuit.

The measure of social desirability employed in Study 2 yielded a low reliability estimate. As measurement error attenuates the relationships among variables, the true associations between social desirability and the goal constructs tapped by the GCEQ could not be reliably explored in the present work. Using valid and reliable measures of social desirability, it would be insightful in future work to test further whether scores derived from the GCEQ are associated with a socially desirable response pattern.

A further limitation is that the populations used in the present analyses displayed prominent ethnic homogeneity, as our samples comprised a majority of White participants. Additionally all study populations were biased towards greater proportions of females and were on average middle-aged. In addition, the physical activity level of the participants was not assessed and therefore their exercising status is unknown. While acknowledging that the theoretical tenets of SDT are hypothesised to be fairly universal across different subgroups (Deci & Ryan, 2002; Grouzet et al., 2005) future research using the GCEQ would do well to strive to achieve greater participant diversity in terms of exercise level and ethnicity as to test the universal applicability of the scale. With regards to participant's exercise level, we acknowledge that this limits the drawing of conclusions pertaining to the utility of the GCEQ in specific samples of regular exercisers or those that do not currently exercise. At present, the GCEQ seems to be most appropriate for those who are at least contemplating exercise participation (Prochaska, DiClemente, & Norcross, 1992). Following the example of Markland and Ingledew's (1997) work with the EMI-2, future work may look to validate the GCEQ in such samples by exploring the effect of rewording the stem of the GCEQ so that those who do not exercise can speculate as to what their exercise goals might be if they commenced an exercise regime. Evidently, a scale's validity is inferred through a combination of correlational analysis and theoretical knowledge (in this case regarding the goal content facet of SDT). While this is a common methodology within scale development research, future work would do well to take the GCEQ beyond the realms of cross-sectional research and test the

value of the goal constructs identified in predicting pertinent exercise-related outcomes (e.g., persistence, enjoyment of exercise and exercise intensity).

3.16 Conclusion

In summary, the three studies presented in this paper forward the GCEQ as a theoretically-based and psychometrically sound tool with which to assess exercise goal content from an SDT-perspective. While further research should be pursued in order to advance understanding of the conceptual, theoretical and psychometric facets of the GCEQ, the resultant scale provides researchers with a promising valid and reliable measure which may help further the application of SDT in the exercise domain.

3.17 Footnote

¹At the request of an anonymous reviewer, we performed the EFA employing an equamax rotation. This orthogonal rotation strategy identified a number of factorially complex items, whereas the direct oblimin strategy produced items that loaded cleanly on single factors. Given our hypothesis based on SDT (Deci & Ryan, 2000) and previous research (Kasser & Ryan, 1996) that the goal factors would be correlated, the results from the oblique direct oblimin procedure were reported.

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CHAPTER 4

Examining Intrinsic Versus Extrinsic Exercise Goals: Cognitive, Affective, and Behavioural Outcomes

Examining Intrinsic Versus Extrinsic Exercise Goals: Cognitive, Affective, and Behavioural Outcomes

4.1 Abstract

Grounded in Self-Determination Theory (SDT) this study had two purposes: (a) examine the associations between intrinsic (relative to extrinsic) exercise goal content and cognitive, affective and behavioural outcomes; and (b) test the mediating role of psychological need satisfaction in the “exercise goal content → outcomes” relationship. Using a sample of 410 adults, hierarchical regression analysis showed relative intrinsic goal content to positively predict physical self-worth, self-reported exercise behaviour, psychological well-being and psychological need satisfaction and negatively predict exercise anxiety. Except for exercise behaviour, the predictive utility of relative intrinsic goal content on the dependent variables of interest remained significant after controlling for participants’ relative self-determined exercise motivation. Structural equation modelling analyses showed psychological need satisfaction to partially mediate the effect of relative intrinsic goal content on the outcome variables. Our findings support further investigation of exercise goals commensurate with the goal content perspective advanced in SDT.

4.2 Introduction

The goals that individuals focus their exercise efforts towards (e.g., to improve their health or to enhance their appearance) are a common foundation from which to explore motivation for, and experiences of exercise engagement. It is postulated within Self-determination theory (SDT; Deci & Ryan, 2000) that “all goals are not created equal” (Ryan, Sheldon, Kasser, & Deci, 1996, p. 7) and that valuing goals with different foci will be differentially associated with well-being and adjustment outcomes (Vansteenkiste, Lens, & Deci, 2006).

Specifically within SDT, goals with *intrinsic* and *extrinsic* content are distinguished. Intrinsic goals are those focused towards developing one’s personal interests, values and potentials and are inherently satisfying to pursue. These characteristics align with the organismic foundations of the self within SDT, as humans are considered to be active and have an innate tendency to develop and refine their sense of self (Deci & Ryan, 2000). Extrinsic goals are primarily characterised by having an “outward” orientation, with one’s pursuits being directed towards external indicators of worth such as wealth, fame and appealing image (Kasser & Ryan, 1993, 1996; Vansteenkiste et al., 2006). Unlike intrinsic goal pursuit, Deci and Ryan (2000) contend that extrinsic goal pursuit neither stems from or contributes to the development of one’s self and may be antithetical to it. Past work focused on people’s life aspirations has considered goals such as community contribution, social affiliation, health and fitness and self-acceptance to reflect intrinsic goals, whereas financial success, appearance, popularity, power and conformity have been categorised as extrinsic goals (Grouzet et al., 2005; Kasser & Ryan, 1996; Vansteenkiste, Neyrinck et al., 2007). The pursuit of intrinsic versus extrinsic life goals has been positively associated with well-being (e.g., self-actualisation and vitality), and negatively associated with indices of ill-being (e.g., depression and anxiety) (see Kasser, 2002; Vansteenkiste, Soenens, & Duriez, 2008 for an overview). Moreover, recent research has found that intrinsic versus extrinsic goals within specific life-domains are associated with adaptive outcomes such as greater job-based satisfaction, vitality and less emotional exhaustion (Vansteenkiste, Neyrinck et al., 2007). The purpose of the present study was to extend this line of inquiry to the exercise domain. Specifically, we sought to: (a) investigate the associations between relative intrinsic exercise goals and a number of exercise-based outcomes (i.e., self-

reported leisure time exercise engagement, exercise-based anxiety, physical self-worth, psychological well-being and psychological need satisfaction); and (b) test whether any associations identified between exercise goals and outcomes were mediated by exercise-based psychological need satisfaction as forwarded within SDT.

4.2.1 *Intrinsic Versus Extrinsic Exercise Goal Content*

The effects of what in SDT is termed *goal content* has received some prior research attention in the exercise domain, in which case the term *exercise motives* or *reasons* was used (Ingledew & Markland, 2008; Maltby & Day, 2001; Markland & Ingledew, 1997, 2007; Silberstein, Striegel-Moore, Timko, & Rodin, 1988). While informative and often couched in Deci and Ryan's framework, this work has not always been directly aligned with the goal content perspective advanced in SDT (see Sebire, Standage, & Vansteenkiste, 2008, Chapter 3). In an attempt to extend goal content research to the exercise context, in our recent work we made a concerted effort to align goal categorisations with the writings of Deci, Ryan, and their colleagues (Deci & Ryan, 2000; Kasser & Ryan, 1996; Sheldon, Ryan, Deci, & Kasser, 2004). Aligned with definitions of intrinsic and extrinsic life aspirations (Kasser & Ryan, 1993, 1996), we labelled domain-specific exercise goals for health management, skill development and social affiliation as having intrinsic content (i.e., reflecting a more self-actualising orientation), and exercise goals of image and social recognition as having extrinsic content (i.e., an outward orientation) (Sebire et al., 2008, Chapter 3). By studying goal contents that align with the intrinsic/extrinsic goal definitions forwarded in SDT we can attempt to further understand motivation for exercise by gaining conceptual precision which in turn facilitates the examination of theoretically derived hypotheses.¹

There is a growing body of empirical evidence to suggest that exercising in the service of intrinsic and extrinsic goals yields differential outcomes. For example although not coming from a SDT-perspective, Crawford and Eklund's (1994) work with a sample of college-aged females documented that the exercise goal of improved appearance (i.e., an extrinsic goal) was positively related, whereas health goals (i.e., an intrinsic goal) were unrelated, to social physique anxiety. Similarly, among regularly exercising undergraduate students, holding appearance-based exercise goals has been shown to correlate positively with indices of ill-being and negatively with self-esteem (Maltby & Day, 2001). Lastly, in a sample of male and female first-time fitness centre members, fitness, competence (tapping skill development) and social

interaction goals positively correlated with class attendance and workout enjoyment, whereas appearance goals were unrelated to attendance, exercise adherence and enjoyment (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997, Study 2).

Although the lack of a measure of exercise-based goal content aligned with the conceptualisation of intrinsic and extrinsic goals within SDT has precluded past research from exploring the concomitants of participants' reported goals, experimental work has examined the contextual promotion of intrinsic and extrinsic goals (see Vansteenkiste, Soenens, & Lens, 2007 for a review). For example, Vansteenkiste, Simons, Lens et al. (2004, Study 3) compared a group of high school students who, prior to learning Tae-bo exercises, read a motivational prime based on intrinsic goals (informing them that learning Tae-bo could help improve their fitness/health) with students who read an extrinsic goal-focused motivational prime (informing them that learning Tae-bo exercise was a useful way to improve their appearance). The intrinsic goal framing group displayed greater behavioural persistence and graded performance on the Tae-bo exercise.

In a further study, Vansteenkiste, Simons, Soenens, and Lens (2004) demonstrated that students exposed to an intrinsic goal manipulation displayed better performance and greater short- and long-term behavioural persistence at the Tae-bo exercise than students in a control group who were not exposed to any goal manipulation (i.e., neither intrinsic nor extrinsic goal promotion). Those exposed to an extrinsic goal manipulation displayed reduced performance compared to both those participants involved in the control and intrinsic goal condition. Interestingly, the pattern of persistence of those involved in the extrinsic goal relative to the control group was mixed, with extrinsic goal framing resulting in less short-term persistence, greater medium-term persistence and equally low long-term persistence. Follow-up within-condition correlation analyses indicated, however, that extrinsic goal-oriented individuals' persistence was not associated with enjoyment and valuation of the activity, whereas it was for those in the control group. Vansteenkiste, Simons, Soenens et al. (2004) argued that the persistence of those in the extrinsic goal condition was less authentic in nature, presumably because it was more strongly oriented towards attaining the primed external indicators of worth. Nevertheless, the findings showed that extrinsic goal framing might prompt individuals to put forth extra effort in the exercise activity at hand.

4.2.2 Intrinsic and Extrinsic Goal Content and Psychological Need Satisfaction

From the SDT perspective, the aforementioned differential effects of intrinsic and extrinsic exercise goal pursuit are brought about due to the degree to which the different goal contents promote satisfaction of individuals' basic psychological needs. Within SDT, three psychological needs are forwarded: autonomy (to experience oneself as the originator of one's behaviour), competence (to feel that one can master challenges) and relatedness (to feel a sense of meaningful connectedness within one's social milieu) (Deci & Ryan, 2000).

Supporting this theoretical reasoning, Rijavec, Brdar, and Miljković (2006) reported intrinsic, relative to extrinsic, life goal pursuit to be positively associated with general need satisfaction (also see Kasser, 2002 for an overview). Further, work in the organisational domain has found the suppression of employees' psychological need satisfaction within the work place to mediate the negative relationships between relative extrinsic work goal pursuit and work-related outcomes (viz., job vitality, job satisfaction and dedication) (Vansteenkiste, Neyrinck et al., 2007). As the satisfaction of one's basic psychological needs represents a critical mechanism by which the disparate effects of intrinsic and extrinsic goal pursuit on outcome variables may be explained (Vansteenkiste, Soenens et al., 2007), in the present work we expected need satisfaction to mediate the "relative intrinsic goal → outcome variable" relationship.

4.2.3 Distinguishing Exercise Goal Content and Behavioral Regulation

It is important to note that within SDT, the content of goals (i.e., intrinsic vs. extrinsic) is conceptually distinguished from the behavioural regulation with which goals are pursued (i.e., whether one's motivation is autonomous or controlled). Briefly, while autonomous motivation stems from the inherent satisfaction or pleasure that a behaviour brings (intrinsic motivation), from aligning one's actions with other aspects of the self (integrated regulation) or from personally valuing a behaviour (identified regulation), controlled motivation reflects behavioural enactment to attain ego-enhancement or suppress intra-individual feelings of guilt, shame and anxiety (introjected regulation), or to comply with external pressuring demands (external regulation) (Ryan & Deci, 2000). Theoretically, it is maintained that intrinsic and extrinsic goals can be pursued for both autonomous and controlled reasons (Deci & Ryan, 2000). To illustrate the distinction, an individual may attend an exercise class to improve their health (an intrinsic goal) because they personally value good health

(autonomous behavioural regulation), or because they feel pressured to improve their health by a medical practitioner (controlled behavioural regulation). Alternatively, an individual may work out to improve their appearance and physical appeal (an extrinsic goal) because they personally value looking good (autonomous behavioural regulation) or because they feel guilty if they do not look good for their partner (controlled behavioural regulation).

Although goal contents and behavioural regulations are conceptually separated within SDT, debate exists as to whether this theorising is supported empirically. Specifically, Carver and Baird (1998) and Srivastava, Locke, and Bartol (2001) have challenged the findings of previous investigations of goal content and well-being (Kasser & Ryan, 1993, 1996) by suggesting that the detrimental effects of pursuing financial success aspirations were reducible to the controlled behavioural regulation associated with such extrinsic goal pursuit. In response to these suggestions, Sheldon et al. (2004) reported a series of studies showing that while intrinsic and extrinsic goals are positively correlated with autonomous and controlled behavioural regulations respectively, both facets predict well-being and adjustment outcomes at the global life level. Such work supports the conceptual tenets forwarded in SDT, and implies that both goal content and behavioural regulation are important in understanding the cognitive and affective correlates of motivational pursuits (Deci & Ryan, 2000).

In the exercise context, mixed support has emerged with respect to the distinction between goal content and behavioural regulation in predicting behavioural outcomes. For instance, in a study of adolescents' exercise goals as individual difference variables, Gillison, Standage, and Skevington (2006) found that in line with the theoretical hypotheses set out in SDT, relationships between intrinsic and extrinsic exercise goal content and self-reported exercise behaviour were only partially mediated by self-determined exercise motivation. In contrast, a recent study by Ingledew and Markland (2008) found support for a motivational model specifying exercise goal content as an antecedent to exercise behavioural regulation, which in turn predicted exercise engagement. Similar findings have been reported in investigations where exercise goals were experimentally manipulated (Vansteenkiste, Simons, Lens et al., 2004, Study 3). In this instance, after controlling for students' autonomous motivation, manipulated exercise goal content did not directly predict

behavioural persistence assessed via student participation in a free-choice exercise activity, although it was uniquely predictive of students' rated performance.

4.2.4 *The Present Research*

This investigation had two main purposes. The first aim was to extend SDT-based research that has previously focused on life aspirations to the exercise domain and explore whether intrinsic relative to extrinsic exercise goals were associated with adaptive exercise outcomes. These variables provide a broad set of outcomes to investigate the effect of different exercise goal pursuit that align with SDT and are relevant to exercise and general life contexts. We hypothesised that relative intrinsic exercise goals would positively predict physical self-worth, psychological well-being, exercise behaviour and psychological need satisfaction, and negatively predict exercise anxiety. Within this aim, aligned with previous work in the general life domain (Sheldon et al., 2004), we sought to explore whether the relationships identified between goals and outcomes would remain significant above and beyond exercise-based behavioural regulations. In addition, we expected these relationships to be present after controlling for the effects of two demographic variables (i.e., age and gender). There is evidence to suggest that advancing age is negatively related to social physique anxiety (Thøgersen-Ntoumani & Ntoumanis, 2006) and physical activity (Davis & Fox, 2006) and is differently associated with aspects of psychological well-being (Keyes & Waterman, 2003). In addition, relative to females, males report greater participation in health promoting physical activity (Martin, Morrow, Jackson, & Dunn, 2000), greater physical self-worth (Fox & Corbin, 1989; Hayes, Crocker, & Kowalski, 1999) and less social physique anxiety (Thøgersen-Ntoumani & Ntoumanis, 2006). Our second aim was to explore the hypothesised mediating role of need satisfaction in the relationships proposed in SDT to exist between relative intrinsic exercise goals and exercise-related outcomes. It was hypothesised that psychological need satisfaction would mediate these associations.

4.3 Method

4.3.1 *Participants*

The initial pool of respondents comprised 424 council employees (i.e., administrative, professional, clerical and technical employees of local government). To ensure that the sample consisted only of individuals who reported participation in

at least some mild exercise, 14 individuals who reported no mild, moderate or vigorous exercise sessions were excluded from subsequent analyses. The final sample ($N = 410$) consisted of 118 males and 292 females (M age = 41.39 years; $SD = 11.02$; range = 20 to 67 years). 97.5% of participants were White.

4.3.2 Procedure

Following the approval of a local ethics committee and the consent of seven Local Authorities from the South West of England, an email was sent inviting employees to participate in an online study of exercise attitudes and behaviours. Data were collected using online questionnaires, accessed through a URL to the study Website that was included in the recruitment email. Participants were required to tick a box indicating their informed consent. Non-consenting participants were invited to close their Web-browser.

4.3.3 Measures

Exercise goal content. The Goal Content for Exercise Questionnaire (GCEQ; Sebire et al., 2008) is a 20-item measure that assesses the importance that people place on three intrinsic (health management, skill development and social affiliation) and two extrinsic (image and social recognition) exercise goals each indexed by four items. Participants responded to the stem “please indicate to what extent these goals are important for you while exercising” using a 7-point scale ranging from 1 (*not at all important*) to 7 (*extremely important*). In the present work, the internal consistency of the subscales was as follows; health management $\alpha = .80$, skill development $\alpha = .86$, social affiliation $\alpha = .82$, image $\alpha = .87$ and social recognition $\alpha = .92$. A relative intrinsic goals variable² was calculated by subtracting the mean of extrinsic goal subscales ($\alpha = .83$) from the mean of intrinsic goal subscales ($\alpha = .85$). As the GCEQ is a recently developed instrument, we performed both first and second order confirmatory factor analyses to assess evidence pertaining to structural validity. Results supported the structural validity of the GCEQ scores in the present sample: First order CFA: $\chi^2(160) = 475.27$, $p < .001$; CFI = .95; SRMR = .05. Second order CFA: $\chi^2(164) = 596.59$, $p < .001$; CFI = .93; SRMR = .09.

Exercise behavioural regulation. The Behavioural Regulation in Exercise Questionnaire (BREQ; Mullan, Markland, & Ingledew, 1997) was used to assess the quality of participants’ motivation towards exercise. Aligned with the conceptualisation of motivation forwarded in SDT, the BREQ comprises 15-items assessing intrinsic, identified, introjected and external motivational regulations. Items

are preceded by the stem “why do you exercise?” and are scored on a 5-point likert scale ranging from 0 (*not true for me*) to 4 (*very true for me*). In the present study, the internal consistency of the subscales were as follows; intrinsic regulation $\alpha = .92$, identified regulation $\alpha = .77$, introjected regulation $\alpha = .78$ and external regulation $\alpha = .73$. The motivation subscales were used to compute a relative autonomy index (RAI). Consistent with theory and past work (e.g., McDonough & Crocker, 2007; Standage & Gillison, 2007), and after confirming that the four regulatory styles conformed to a simplex pattern (i.e., more proximal regulations on the continuum correlated to a higher degree than more distal regulations) in the present data, the RAI was calculated using the following equation; $(\text{external regulation} \times -2) + (\text{introjected regulation} \times -1) + (\text{identified regulation} \times 1) + (\text{intrinsic regulation} \times 2)$.

Psychological need satisfaction. Satisfaction of the psychological needs for autonomy, competence and relatedness in the context of exercise was assessed using the Psychological Need Satisfaction in Exercise Questionnaire (PNSE; Wilson, Rogers, Rodgers, & Wild, 2006). The PNSE assesses each need with 6-items scored on a 6-point likert scale ranging from 1 (*false*) to 6 (*true*). In the present study, the internal consistencies of the subscales were; autonomy $\alpha = .95$, competence $\alpha = .93$ and relatedness $\alpha = .94$. The 18-items were averaged to create a composite psychological need satisfaction in exercise score ($\alpha = .92$).³

Exercise anxiety. Exercise-related social anxiety was assessed via the Physical Activity and Sport Anxiety Scale (PASAS; Norton, Hope, & Weeks, 2004). The PASAS is a 16-item measure that assesses individuals’ fear of negative evaluation and related avoidance in the physical activity and athletic domains (e.g., “I feel nervous if other people are watching me when I am exercising/working out”) using a 5-point likert scale ranging from 1 (*extremely uncharacteristic of me*) to 5 (*extremely characteristic of me*). Item responses were summed to form an anxiety score ($\alpha = .94$).

Physical self-worth. The six-item physical self-worth subscale from the Physical Self Perception Profile (PSPP; Fox & Corbin, 1989) was used to assess perceptions of worth regarding aspects of the physical self (i.e., happiness, satisfaction, pride, respect and confidence). When completing the PSPP, participants are presented with two statements describing how a person perceives their physical self, for example “Some people feel extremely satisfied with the kind of person they are physically BUT others sometimes feel a little dissatisfied with their physical selves.” Participants are first asked to decide which of the statements best describes

them, and then to endorse the chosen statement as either *sort of true for me* or *very true for me*. Reverse scoring was applied to appropriate items, and the six items were then averaged to form an overall physical self-worth score ($\alpha = .87$).

Leisure time exercise participation. The Godin Leisure Time Exercise Questionnaire (LTEQ; Godin & Shephard, 1985) was employed to obtain self-reported frequency of participation in mild, moderate and strenuous exercise in bouts greater than 15 minutes during a typical week. A total exercise index was computed by assigning the mild, moderate and strenuous scores weights of 3, 5 and 9 METs (Metabolic Equivalents) respectively, and summing these weighted scores. The LTEQ has demonstrated validity in comparison to objective assessment tools such as accelerometers (Jacobs, Ainsworth, Hartman, & Leon, 1993).

Psychological well-being. Consistent with past work (e.g., Ryan & Deci, 2001), two indicators were combined to provide a composite score of psychological well-being. The 7-item Subjective Vitality Scale (Ryan & Frederick, 1997) was used to assess feelings of vitality (e.g., “I feel energised”). Items are scored on a seven-point likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The alpha coefficient in the present study was $\alpha = .94$. In addition, the Depression-Happiness Scale (McGreal & Joseph, 1993) was employed to assess feelings of depression and happiness experienced in the past week. This scale consists of 25 items (e.g., “I felt cheerful” or “I felt like crying”) rated on a 4-point likert scale ranging from 0 (*never*) to 3 (*often*). Responses were scored in a bipolar fashion in which depression item scores were reversed and then summed with scores on happiness items ($\alpha = .93$). The average of the happiness items was negatively correlated with the average of the depression items ($r = -.62, p < .000$). Higher scores reflect greater perceptions of happiness and lower feelings of depression. Scores for vitality and depression-happiness were summed to form a composite psychological well-being variable.

4.4 Results

4.4.1 Descriptive Statistics and Relationships among Study Variables

Table 4.1 presents descriptive statistics and bivariate correlations showing associations among the study variables. Participant age was positively, albeit weakly correlated with psychological well-being, and negatively correlated with exercise behaviour. In addition, independent *t*-tests revealed that females reported significantly

greater exercise anxiety than males ($M_s = 40.82$, $SD = 15.04$ and 35.01 , $SD = 13.65$, respectively) $t(422) = -3.62$, $p < .01$ (Hedges $g = 0.40$), and significantly lower physical self-worth ($M_s = 2.42$, $SD = 0.63$ and 2.65 , $SD = 0.55$, respectively) $t(422) = 3.39$, $p < .01$ (Hedges $g = -0.38$). Females also tended to report less exercise participation than males ($M_s = 39.71$, $SD = 24.52$ and 44.64 , $SD = 21.70$ respectively) $t(422) = 1.92$, $p = .06$ (Hedges $g = -0.21$). As expected, relative intrinsic exercise goal content correlated positively with RAI.⁴ Further, both goal constructs displayed correlations with the dependent variables in the expected directions.

As previous work has shown goal content and behavioural regulations to be correlated (Sheldon et al., 2004), before conducting the regression analyses the data were screened for evidence of collinearity in line with the recommendations of Tabachnick & Fidell (2007). The variance inflation factor (1.00–1.21) and tolerance (0.83–1.00) statistics resided within acceptable ranges. In addition, we simultaneously screened the condition indexes and the variance proportion factors (Edmunds, Ntoumanis, & Duda, 2006; Pedhazur, 1997). The results suggested that collinearity was not evident in our data as when the condition index exceeded 10, no two predictors displayed variance proportion factors greater than .50.

Five separate hierarchical (or sequential) regression analyses were conducted to examine the utility of relative intrinsic goal content in predicting the criterion variables (viz., physical self-worth, exercise anxiety, exercise behaviour, psychological well-being and psychological need satisfaction). This approach is (a) aligned with previous work analysing the unique contributions of goal content and behavioural regulations (i.e., Sheldon et al., 2004) and (b) appropriate to answer the scientific question at hand by providing the unique variance (or contribution) accounted for by the theoretical set of variables in an incremental and cumulative fashion (cf. Cohen, Cohen, West, & Aiken, 2003). In view of the preliminary analysis that showed associations between some dependent variables and gender and age, these demographic variables were entered in Step 1 of each regression analysis. Relative intrinsic goals were entered at Step 2. At Step 3, exercise RAI was entered so as to examine whether relationships between participants' relative intrinsic goal scores and the dependent variables remained significant after controlling for relative autonomous motivation towards exercise. The results of the hierarchical regressions are displayed in Table 4.2.

Table 4.1

Descriptive Statistics and Bivariate Correlations among Study Variables

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8
1. Age	41.39	11.02	-							
2. Relative intrinsic goals	0.92	1.05	.11*	-						
3. Relative autonomy	6.37	3.27	.18*	.41**	-					
4. Need satisfaction	4.17	.89	-.07	.29**	.50**	-				
5. Exercise anxiety	39.14	14.87	-.08	-.33**	-.45**	-.28**	-			
6. Physical self-worth	2.50	0.62	.10*	.36**	.52**	.42**	-.54**	-		
7. Exercise behaviour	41.13	22.62	-.09	.13**	.38**	.34**	-.23**	.28**	-	
8. Psychological well-being	57.51	13.06	.15**	.29**	.46**	.27**	-.39**	.51**	.23**	-

Note. * $p < .05$. ** $p < .01$.

Table 4.2

Hierarchical Regression Analyses Predicting Physical Self-worth, Exercise Anxiety, Exercise Behaviour, Psychological Well-being and Psychological Need Satisfaction from Age, Gender, Relative Intrinsic Goal Content and Relative Autonomy

Independent variables	Dependent variables														
	Physical self-worth			Exercise anxiety			Exercise behaviour			Psychological well-being			Psychological need satisfaction		
	Adj. R^2	β	t	Adj. R^2	β	t	Adj. R^2	β	t	Adj. R^2	β	t	Adj. R^2	β	t
Step 1	.03			.03			.01			.02			.01		
Age		.10	1.96*		-.08	-1.57		-.09	-1.92		.15	3.01**		-.07	-1.48
Gender		-.16	-3.18**		.18	3.64**		-.10	-2.01*		-.04	-0.71		-.08	-1.63
Step 2	.15			.13			.03			.09			.10		
Age		.06	1.25		-.04	-0.90		-.11	-2.23*		.12	2.47*		-.11	-2.25*
Gender		-.15	-3.20**		.17	3.67**		-.10	-1.95		-.03	-0.59		-.06	-1.55
Relative intrinsic goals		.35	7.67**		-.32	-6.86**		.14	2.83**		.28	5.92**		.30	6.42**
Step 3	.30			.24			.16			.22			.27		
Age		.03	0.60		-.01	-0.33		-.14	-3.04**		.09	2.00*		-.14	-3.29**
Gender		-.12	-2.85**		.15	3.35**		-.07	-1.52		-.00	-0.05		-.04	-1.01
Relative intrinsic goals		.18	3.99**		-.17	-3.63**		-.02	-0.41		.12	2.58**		.12	2.63*
Relative autonomy		.43	9.51**		-.37	-7.82**		.40	8.06**		.40	8.27**		.46	9.88**

Note. Adj. R^2 = Adjusted R^2 . * $p < .05$. ** $p < .01$.

In line with our hypotheses, after controlling for age and gender, relative intrinsic goal content positively predicted significant variance in physical self-worth, exercise behaviour, psychological well-being and psychological need satisfaction and was negatively related to exercise anxiety. All of these relationships, except for the relationship between relative intrinsic goal content and exercise behaviour⁵ remained significant at the final step after entering relative autonomous motivation.⁶

4.4.3 Mediating Role of Basic Need Satisfaction

Another important aim of this research was to examine whether basic need satisfaction would mediate the observed associations between relative intrinsic goal content and the dependent variables. Because the bivariate correlations and hierarchical regression analyses identified relationships between relative intrinsic goal content and four of the five dependent variables, we sought to further examine the role of psychological need satisfaction in the relations between relative intrinsic goal content and physical self-worth, exercise anxiety and psychological well-being, thus excluding exercise behaviour. Structural equation modelling (SEM) using AMOS Version 7.0 (Arbuckle, 2006) was used to examine these relationships.

The covariance matrix was analysed using the maximum likelihood estimation method. Inspection of the Mardia's coefficient (Mardia's Coefficient = 13.01, critical ratio = 7.92) revealed multivariate non-normality in the data. Accordingly, analyses were performed using a bootstrapping technique (see Efron & Tibshirani, 1993). In line with recommendations of Preacher and Hayes (2008) 5000 bootstrap samples with replacement based on the original sample were requested. Bootstrapping is beneficial under conditions of non-normality as the bootstrap-generated standard errors provide a more accurate indication of the parameter estimate stability (Byrne, 2001; Nevitt & Hancock, 2001).

In line with the two-index presentation strategy advanced by Hu and Bentler (1998), model fit was deemed satisfactory where the comparative fit index (CFI) was >.90 (Bentler, 1995) and excellent where CFI was close to or >.95 (Hu & Bentler, 1999). For the standardised root mean square of the residual (SRMR), values of .08 (or lower) are indicative of well-specified models (Bentler, 1995). Commensurate with recent recommendations (Cheung & Lau, 2008; MacKinnon, Lockwood, & Williams, 2004; Shrout & Bolger, 2002) the mediating effect of psychological need satisfaction was explored by examining the 95% upper and lower limits of bootstrap-generated bias-corrected confidence intervals (CI) of the indirect effects.

To permit an adequate participant to estimated parameter ratio, latent variables representing relative intrinsic goals, physical self-worth and exercise anxiety were created using a parcelling technique. In a discussion of the arguments for and against the parcelling technique, Little, Cunningham, Shahar, and Widaman (2002) contend that when the primary aim of analysis is to understand the associations between latent variables rather than associations between items, parcelling is appropriate as it is a pragmatic solution that (a) reduces the number of estimated parameters in SEM models thus aiding model identification and (b) may reduce non-normality within data. Physical self-worth and exercise anxiety latent variables were indexed by two randomly generated parcels each, formed by averaging the sum of the appropriate randomly selected items. Two parcels representing relative intrinsic goals were created by subtracting the average of half of the extrinsic goal items from the average of half of the intrinsic goal items (ensuring balanced representation of each goal factor in each parcel). This process was repeated with the remaining halves of the extrinsic and intrinsic goal items to create the second parcel. In line with previous research (Deci et al., 2001; Standage, Duda, & Ntoumanis, 2005), a latent variable representing total need satisfaction was indexed using autonomy, competence and relatedness subscale scores as indicators. Subjective vitality and depression-happiness scores served as two independent observed indicators for the psychological well-being latent variable. Owing to significant correlations between the three psychosocial dependent variables (see Table 4.1) their disturbance terms were allowed to covary. These minor modifications resulted in an adequate participant to estimated parameter ratio (15:1) (Bentler & Chou, 1987) and the model was found to be adequately identified.

Aligned with the hypothesised sequence of motivational processes advanced in SDT, a model (Figure 4.1) was tested in which relative intrinsic goals predicted psychological need satisfaction which in turn (positively) predicted physical self-worth and psychological well-being and (negatively) predicted exercise anxiety. This model displayed a satisfactory fit to the data; $\chi^2(37) = 194.26, p < .001$; CFI = .93; SRMR = .07. The standardised parameter estimates showed relative intrinsic goal content scores to positively predict psychological need satisfaction which was in turn positively predictive of physical self-worth and psychological well-being and negatively predictive of exercise anxiety. The significant standardised indirect effects observed between relative intrinsic goals and the dependent variables [physical self-worth ($\beta = .29$, 95% CI = .17 to .42), exercise anxiety ($\beta = -.21$, 95% CI = -.31 to -.12)]

and psychological well-being ($\beta = .26$, 95% CI = .16 to .38)] supported a mediating role of psychological need satisfaction as advanced in SDT.

To examine whether psychological need satisfaction fully or partially mediated the effects of relative intrinsic goal content on the dependent variables, a second model which specified direct paths from relative intrinsic exercise goals to physical self-worth, exercise anxiety and psychological well-being was tested. This re-specified model (Figure 4.2) displayed improved fit to the data; $\chi^2(34) = 168.78$, $p < .001$; CFI = .94; SRMR = .05. Examination of the bootstrap-generated bias-corrected CIs revealed that in addition to significant direct effects (which are aligned with the results of the first model), significant standardised indirect effects emerged for relative intrinsic goal content on physical self-worth ($\beta = .17$, 95% CI = .10 to .26), exercise anxiety ($\beta = -.11$, 95% CI = -.18 to -.06), and psychological well-being ($\beta = .17$, 95% CI = .09 to .28). Such findings support partial mediation. Inspection of the percentage of the total effect that was attributable to the indirect effect (physical self-worth = 40%, exercise anxiety = 31%, psychological well-being = 56%) suggested that a substantial amount of the variance in the outcome variables was accounted for by the mediating role of need satisfaction.

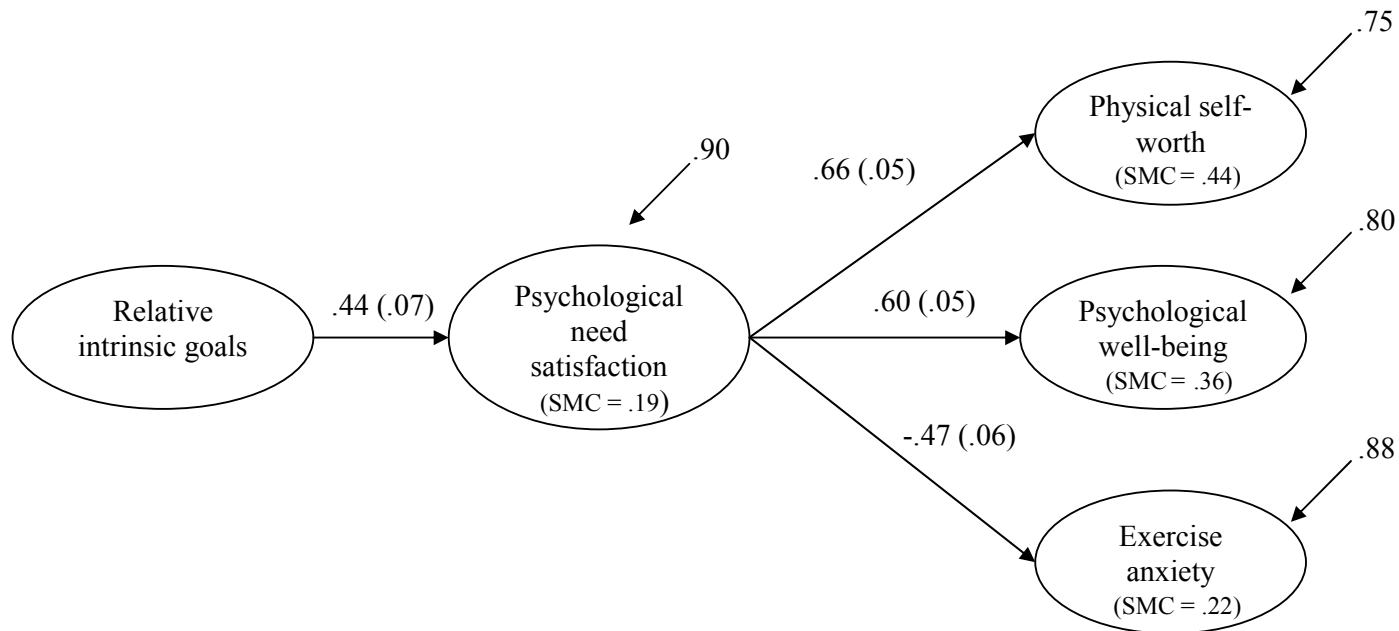


Figure 4.1 Preliminary structural model showing relationships between relative intrinsic exercise goals, psychological need satisfaction and outcomes as hypothesised within self-determination theory.

Note. All paths are standardised and significant (i.e., $Z > 1.96$). Bootstrap standard errors of the parameter estimates are shown in parentheses.

The proportion of explained variance in each exogenous variable is indicated by the squared multiple correlation (SMC). The correlations between the disturbance terms of the dependent variables were: $r_{\text{physical self-worth-exercise anxiety}} = -.42$; $r_{\text{exercise anxiety-psychological well-being}} = -.20$;

$r_{\text{physical self-worth-psychological well-being}} = .36$.

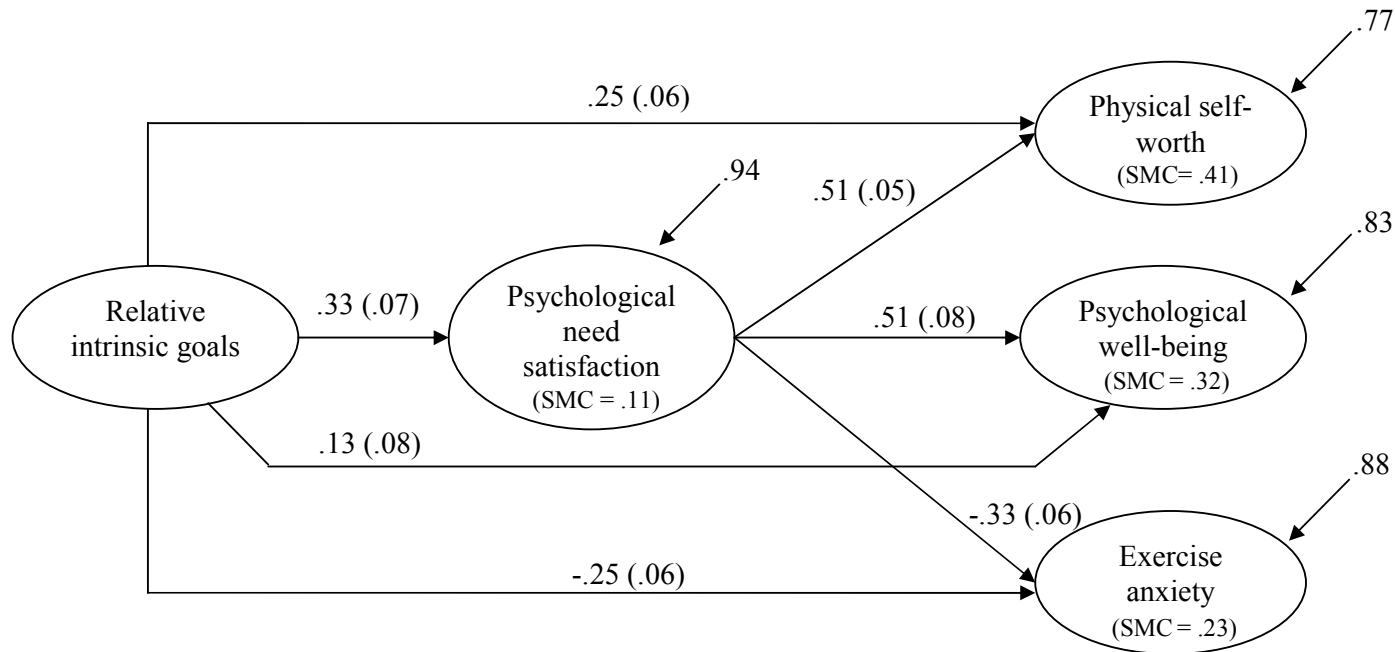


Figure 4.2 Revised structural model showing direct and indirect relationships between relative intrinsic exercise goals, psychological need satisfaction and outcomes.

Note. All paths are standardised and significant (i.e., $Z > 1.96$). Bootstrap standard errors of the parameter estimates are shown in parentheses.

The proportion of explained variance in each exogenous variable is indicated by the squared multiple correlation (SMC). The correlations between the disturbance terms of the dependent variables were: $r_{\text{physical self-worth-exercise anxiety}} = -.42$; $r_{\text{exercise anxiety-psychological well-being}} = -.23$;

$r_{\text{physical self-worth-psychological well-being}} = .40$.

4.5 Discussion

The present study examined (a) the relationship between relative intrinsic exercise goal content and a range of exercise-related outcomes and psychological well-being and (b) the mediating role of exercise-based psychological need satisfaction in the relationships between relative intrinsic exercise goals and the dependent variables. In general, the findings supported our hypotheses and the theoretical tenets put forth in SDT (cf. Deci & Ryan, 2000).

4.5.1 *Relative Intrinsic Exercise Goals*

Previous work has documented positive associations between valuing intrinsic relative to extrinsic goals and adaptive outcomes at a global level (Kasser & Ryan, 1993, 1996) and in specific life domains (Vansteenkiste, Neyrinck et al., 2007). Extending this work to the exercise context, our results support such findings, as placing greater importance on intrinsic exercise goals (i.e., improving one's health, advancing one's exercise skills or fostering meaningful relationships) relative to extrinsic exercise goals (i.e., enhancing one's image and being recognised for one's exercise behaviours) were positively associated with reported exercise engagement, physical self-worth and psychological well-being and negatively associated with feelings of anxiety. Our study is the first in the exercise context to use a relative-goal approach as recommended within the SDT literature (Deci & Ryan, 2000; Sheldon et al., 2004) and highlights the importance of studying contextual-level goal content and their effects on cognitive and affective outcomes in addition to overarching life aspirations. The findings support previous research using some absolute exercise goals that could be classed as intrinsic or extrinsic (Crawford & Eklund, 1994; Maltby & Day, 2001; Ryan et al., 1997, Study 2) and advance such inquiry by highlighting the adaptive outcomes of adopting an exercise goal orientation dominated by intrinsic pursuits rather than studying the goal constructs in isolation.

Not only does the present data show intrinsic goal content to contribute to more adaptive affective and behavioural functioning in exercise, but also that most of these effects remain significant when controlling for the effects of exercisers' relative autonomous regulation towards exercise engagement. This is an important finding, as some researchers (e.g., Carver & Baird, 1998; Srivastava et al., 2001) have criticised the differentiation between intrinsic and extrinsic goals for being conceptually analogous to the distinction between autonomous and controlled behavioural

regulation. Both types of conceptualisations are indeed empirically related to one another, as also shown in the present research, presumably because they both assess exercisers' quality of motivation. Nevertheless, commensurate with previous findings pertaining to life aspirations (Sheldon et al., 2004), the relationships identified between relative intrinsic exercise goals and physical self-worth, well-being and exercise anxiety remained significant after accounting for relative autonomous exercise motivation. Relative autonomous motivation yielded a significant effect on all outcomes in the expected directions, thereby supporting the findings of previous research (Thøgersen-Ntoumani & Ntoumanis, 2006; Wilson, Rodgers, Fraser, & Murray, 2004).

No independent effect of relative intrinsic goal content over relative autonomous motivation was found for self-reported exercise behaviour. Although departing from our hypothesis, this finding is consistent with previous observations regarding objective behavioural (rather than self-reported) indices of exercise (Vansteenkiste, Simons, Lens et al., 2004) and aligns with a model of motivation forwarded by Ingledew and Markland (2008). With the latter in mind, Ingledew and Markland's model specifies goal content as an antecedent to behavioural regulation which in turn positively predicts exercise engagement. While supporting the empirical evidence pointing towards the beneficial cognitive and affective consequences of both relative intrinsic goals and relative autonomous motivation (Sheldon et al., 2004), our findings suggest that relative intrinsic exercise goal content may be predictive of exercise behaviour to the degree that it is associated with autonomous versus controlled exercise behavioural regulation. Perhaps a feasible explanation for this null finding may reside with potential variations in the temporal focus of the "what" and "why" variables couched within SDT. Specifically, it may be that the focus on the content of one's exercise goals (or the "what" facet) are too distal (e.g., the promise of social recognition, the ideal appearance, etc) to predict recently enacted behaviour, especially above and beyond the reasons (or "why") by which one is motivated to act. As the present data showed intrinsic and extrinsic goals to be associated with autonomous and controlled motivation respectively, future longitudinal research would do well to examine whether the "why" facet of SDT serves to mediate the effects of one's goal content on recent- and longer-term patterns of exercise behaviour.

Future work might also want to examine this null-effect of goal-content on exercise behaviour using improved methodological procedures. First, similar to recent work (e.g., Standage, Sebire, & Loney, 2008) examining the relationships between motivational regulations and exercise behaviour, future research might want to advance on the current findings, employing more objective estimates of exercise engagement (i.e., rather than self-reported) before any firm conclusions can be drawn regarding the utility of the “what” in predicting behavioural exercise engagement above and beyond the “why”. Second, in doing so, it would be particularly useful to examine the emotional experience that goes along with exercising, because it is possible that, although relatively intrinsic and extrinsic goal-oriented individuals may not engage in exercise to a quantitatively different degree, their exercise engagement might be associated with more feelings of anxiety and negative affect rather than vitality and positive affect. In line with such a suggestion, Vansteenkiste, Simons, Soenens, et al. (2004) found that the exercise engagement of participants involved in an extrinsic goal framing condition was less authentic relative to those involved in an intrinsic goal condition. Third, longitudinal assessment of exercise engagement would be advantageous, as extrinsic goal valuation might prompt some initial exercise engagement but is unlikely to foster long-term exercise adherence (Vansteenkiste, Simons, Soenens et al., 2004).

Considering the amount of variance in all assessed outcomes that is accounted for by relative intrinsic goal content and relative autonomous behavioural regulation, it should be noted that in each case relative autonomous behavioural regulation accounted for a greater proportion of variance than did goal content. These findings are in line with those of Sheldon et al. (2004), who found autonomous and controlled reasons to be more strongly predictive of well-being than were goal contents. One reason why this might be the case is that goals are by definition more cognitive in nature, while autonomous and controlled regulations rather reflect subjective experiences, which are more likely to be associated with affective outcomes, as the ones assessed in the present research. For instance, discriminating attitudes towards obese or less active individuals might be more strongly affected by exercisers’ goal content than by their exercise regulation (see Duriez, Vansteenkiste, Soenens, & Dewitte, 2007), an issue that might be investigated in future work.

From an applied perspective, our findings suggest that exercisers and exercise practitioners alike may benefit by paying attention to the explicit content of their own,

or their clients exercise goals respectively, in addition to the behavioural regulations attributed to the goals. In future work conducted in ecologically valid exercise settings, researchers may wish to study the degree to which exercise environments, promotion schemes and practitioners advocate intrinsic and extrinsic exercise goals and the associations that such goal promotions may have with people's exercise goals, behavioural regulation, and the engagement, enjoyment and experience of exercise participation.

4.5.2 Exercise Goals and Psychological Need Satisfaction

The theoretical tenets put forth in SDT hold that relative intrinsic goal pursuit yields adaptive benefits via the facilitation of psychological need satisfaction (Kasser, Ryan, Couchman, & Sheldon, 2004). This study represents the first attempt to test such reasoning in the exercise domain. It was found that relative intrinsic exercise goals positively predicted psychological need satisfaction. Consistent with the other psychosocial dependent variables in the study, this effect remained significant after controlling for participants' level of self-determination. In line with past work in other physical activity contexts (McDonough & Crocker, 2007; Reinboth, Duda, & Ntoumanis, 2004), psychological need satisfaction was positively predictive of well-being and physical self-worth while being negatively predictive of exercise anxiety.

With regards to mediation, the SEM analysis showed that consistent with past work and theoretical propositions (Vansteenkiste et al., 2006) psychological need satisfaction partially mediated the effect of relative intrinsic goal content on physical self-worth, exercise anxiety and well-being. These findings align with hypotheses that intrinsic goals promote an inward orientation and facilitate the satisfaction of one's psychological needs, whereas extrinsic goals are oriented towards external indicators of worth and thus thwart psychological need satisfaction (Deci & Ryan, 2000). Research in the organisational domain (Vansteenkiste, Neyrinck et al., 2007) has identified mediation of the effects of employment goal content on job-related outcomes by psychological need satisfaction at work, our results suggest that ascribing more importance to intrinsic, relative to extrinsic exercise goals has beneficial effects on outcomes both directly, and indirectly via exercise-based psychological need satisfaction.

When attempting to explain why goals with diverse content might differently satisfy psychological needs, goal content researchers have proposed various cognitive-attentional processes (labelled micro-mediational mechanisms) hypothesised to be

proximally related to intrinsic and extrinsic goal pursuit (see Vansteenkiste, Soenens, & Duriez, 2008 for an overview). Specifically, three micro-mediational mechanisms have been forwarded to help understand the effects of relative intrinsic goal pursuit on basic need satisfaction, that is, the proposition that extrinsic relative to intrinsic, goals: (a) focuses people's attention towards factors external to the exercising task, thus undermining a strong absorption in the task at hand (Vansteenkiste, Matos, Lens, & Soenens, 2007); (b) induces stressful interpersonal comparisons within the exercise setting; and (c) promotes a rigid approach to both the exercise activity (i.e., superficial task engagement) and other people in the exercise setting (i.e., objectifying others rather than fostering meaningful relationships). The attentional shift, engagement in social comparison processes and rigid approach that is more likely to go along with the pursuit of extrinsic, relative to intrinsic, goals might help to explain why extrinsic, relative to intrinsic, goal oriented individuals fail to get their basic needs for competence, relatedness and autonomy met. At present however, research exploring these mechanisms is in its early stages. Therefore, future studies exploring experiences of, and approaches to exercise of those oriented towards pursuit of relatively strong intrinsic or extrinsic exercise goals would help to further develop previously identified processes and perhaps discover alternative micro-mediational mechanisms.

4.5.3 Limitations

The present results are based on data from a homogeneous sample. As such, future work would do well to extend the findings from our sample to more diverse populations. A second limitation of this work is the cross-sectional study design, meaning directional effects can only be inferred from the hypotheses but were not explicitly tested with the present dataset. Although the tenets set out in SDT and the present findings suggest that relative intrinsic goal pursuit yields psychological need satisfaction, the goal content-need satisfaction relationship is forwarded as bi-directional, such that extrinsic goal pursuit may lead to need satisfaction, or be compensation for previously thwarted psychological needs (Kasser, 2002; Williams, Cox, Hedberg, & Deci, 2000). Longitudinal research designed to explore the temporal interplay between exercise-related psychological need satisfaction and exercise goal content in naturally occurring exercise contexts may facilitate understanding of the possible cyclical nature of these variables. Finally, the present study and past research exploring the effects of both the *what* and *why* on exercise behaviour has employed

self-reported measures of exercise behaviour/participation (Gillison et al., 2006; Ingledew & Markland, 2008). Future work embracing technological advances in the objective estimation of exercise behaviour (see Standage et al., 2008) may assist in further understanding the interrelationships among the *what* and *why* facets of SDT and exercise behaviour.

4.6 Conclusion

In support of SDT, the present research shows that the content of exercisers' goals can be useful in understanding adaptive psychosocial exercise outcomes, and that such inquiry is informative alongside the study of exercise behavioural regulations. The results also showed that the positive effects of relative intrinsic exercise goal content on physical self-worth, exercise anxiety and psychological well-being were partially mediated by satisfaction of exercisers' psychological needs. Together, these findings highlight the explicit content of exercisers' goals as worthy of consideration when attempting to understand important outcomes in the exercise domain.

4.7 Footnotes

¹ As conceptual clarity is central to the present work, the term *exercise goal content* will be used to refer to the explicit content of exercise goals.

² A relative extrinsic goal composite variable will give equivalent results to a relative intrinsic goal score but with opposite signs. We decided in this study to focus on the relative *intrinsic* goal perspective.

³ This approach represents a deviation from that used by the authors of the PNSE (Wilson et al., 2006) although past SDT work has employed a composite need satisfaction score (Deci et al., 2001). As such we performed a higher order CFA to investigate whether the three PNSE scores could be represented by a composite need satisfaction variable. After constraining the uniqueness of the competence variable to zero owing to a negative variance estimate, the fit of the model to the data was as follows: $\chi^2(133) = 553.42, p < .001$; CFI = .94; SRMR = .05, supporting the use of a composite psychological need satisfaction variable.

⁴ We conducted a CFA using the GCEQ and BREQ items simultaneously to explore the constructs representing the “what” and “why”. Nine latent variables were specified reflecting the five GCEQ and four BREQ subscales. The fit of the CFA model to the data was good; $\chi^2(524) = 157.40, p < .001$; CFI = .92; SRMR = .06. All items loaded significantly ($p < .001$) on their intended factor with a value of $> .42$ (71% of factor loadings were $\geq .70$). Inspection of modification indices revealed no problematic cross-loading items.

⁵ Given that exercise behavioural regulation has been found to be predictive of vigorous and purposeful engagement in exercise rather than lower intensity incidental behaviours (Edmunds et al., 2006) we repeated our regression analysis using separate mild, moderate and strenuous exercise components of the LTEQ. Both relative intrinsic exercise goal content and exercise RAI were significant and positive predictors of moderate and strenuous exercise engagement intensities. In line with our finding pertaining to total exercise behaviour, after entering RAI, the relationship between relative intrinsic goals and both moderate and strenuous exercise behaviour indices were no longer significant.

⁶ At the request of an anonymous reviewer, we repeated the hierarchical regression analysis using individual intrinsic and extrinsic goal content variables at Step 2 and individual autonomous and controlled behavioural regulation variables at

Step 3. The results largely replicated the analyses using relative goal content and behavioural regulation variables. Intrinsic goals positively, and extrinsic goals negatively, predicted physical self-worth at Steps 2 and 3. Intrinsic goals negatively, and extrinsic goals positively, predicted exercise anxiety at Steps 2 and 3. Psychological well-being was positively predicted by intrinsic goals and negatively predicted by extrinsic goals at Steps 2 and 3. Exercise behaviour was positively predicted by intrinsic goals at Step 2 but not at Step 3. Finally, intrinsic goals were a positive predictor of psychological need satisfaction at Steps 2 and 3 whereas extrinsic goals did not predict this variable. A table of these results is available from the first author on request (see Appendix 4.6).

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CHAPTER 5

“Coveting thy neighbour’s legs”: Qualitative
Analysis of the Experiences of Exercisers
Pursuing Relative Intrinsic and Extrinsic Goals

“Coveting thy neighbour’s legs”: Qualitative Analysis of the Experiences of Exercisers Pursuing Relative Intrinsic and Extrinsic Goals

5.1 Abstract

In the present study we sought to elicit the experiences of individuals exercising for intrinsic or extrinsic goals as defined within self-determination theory (Deci & Ryan, 2000). Semi-structured interviews were conducted with six adult exercisers reporting relative intrinsic exercise goal pursuit, and five adult exercisers reporting relative extrinsic goal pursuit. Using Interpretative Phenomenological Analysis (Smith & Osborn, 2003), two higher order domains were identified: first, the domain *social factors* pertained to themes of *observation of others* and *emotions following observations or interpersonal comparisons*; second, the domain of *goal pursuit* encompassed the themes *expectations and beliefs*, *markers of progress* and *reactions to (lack of) goal achievement*. The themes highlighted convergence and divergence in the experiences of exercise by relative intrinsic and relative extrinsic goal-focused exercisers and are discussed in relation to possible cognitive-attentional mechanisms operating during exercise goal pursuit.

5.2 Introduction

Emma: It's not about health...it's about [laughs] appearance pure and simple.

Irene: I wanted to keep fit really and use your body, if you don't use it you lose it.

Emma and Irene are members of the same gym in the South West of England. However, their exercise goals are clearly quite different. It is likely that the differing goals that Emma and Irene aspire to will have important implications for their exercise experiences (e.g., emotions, enjoyment, affect etc). Indeed, previous research has shown the focus of one's exercise goal pursuit to differently predict a number of cognitive, affective and behavioural aspects of exercise (Sebire, Standage, & Vansteenkiste, 2009, Chapter 4; Vansteenkiste, Simons, Soenens, & Lens, 2004). To further understand what factors might account for the differential effects of intrinsic and extrinsic exercise goal pursuit, in the present study we qualitatively explored the experiences of individuals who pursue exercise goals with different content. As facilitating the commencement and maintenance of exercise behaviours is central to national frameworks on health (Department of Health, 2004), understanding the different experiences of those driven to exercise by different goals could inform future research and intervention strategies.

5.2.1 *Intrinsic and Extrinsic Goal Content*

The content of exercise goals can be studied using self-determination theory (SDT; Deci & Ryan, 2000). From this perspective, goals are defined as *intrinsic* or *extrinsic* based on whether their pursuit facilitates or thwarts the satisfaction of three innate psychological needs (Deci & Ryan, 2000; Vansteenkiste, Ryan, & Deci, 2008). These needs are for autonomy (i.e., to experience volition and be the origin of one's behaviours and experiences), competence (i.e., to experience effectance in one's environment) and relatedness (i.e., to experience a reciprocal caring or meaningful connection with others) (Deci & Ryan, 2000). These needs are conceptualised as necessary requirements of optimal psychological well-being and human functioning (Deci & Ryan, 2000).

Life-domain goals such as health and fitness, self-acceptance, social affiliation and community contribution are characterised by a *being* orientation (Fromm, 1976), are hypothesised to facilitate the realisation of one's true potentials and lead to

psychological need satisfaction. Accordingly, such goals are classified as intrinsic (Grouzet et al., 2005; Kasser & Ryan, 1996). Alternatively, strivings towards amassing wealth, fame and an attractive appearance are characterised by an outward (Williams, Cox, Hedberg, & Deci, 2000) or *having* orientation (Fromm, 1976) and are focused towards external indicators of worth. As such, these goals are labelled as extrinsic and are hypothesised to be unrelated to psychological need satisfaction (Grouzet et al., 2005; Kasser & Ryan, 1996).

Past work shows that placing greater importance on extrinsic, relative to intrinsic, life aspirations is detrimental to the psychological, health and social aspects of people's lives (see Vansteenkiste, Soenens, & Duriez, 2008 for an overview). For example, relative extrinsic goal pursuit has been associated with lower well-being (e.g., self-actualisation, vitality and positive affect), greater ill-being (e.g., depression and anxiety), physical symptoms (e.g., headaches) (Kasser & Ryan, 1993, 1996), poor ethical and social functioning (Duriez, Vansteenkiste, Soenens, & De Witte, 2007) and greater participation in behaviours likely to pose a health risk (e.g., smoking, and drinking alcohol) (Williams et al., 2000). Such maladaptive consequences hold even when individuals achieve their extrinsic goals (Niemic, Ryan, & Deci, in press; Sheldon & Kasser, 1998; Van Hiel & Vansteenkiste, in press).

There is also evidence that children and adolescents can be primed to learn activities (including exercises) in the service of intrinsic and extrinsic goals, and that these primes can have pervasive effects on learning, motivation, performance and behavioural persistence (Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004 Study 3; Vansteenkiste, Simons, Soenens et al., 2004). Using a short text to experimentally frame intrinsic (i.e., health) and extrinsic (i.e., image) goals for learning about the Asian sport of tae-bo in a physical educational context, Vansteenkiste and colleagues have shown that pupils in intrinsic goal framing groups display greater conceptual rather than superficial learning, better test performance and greater persistence relative to pupils in the extrinsic goal framing conditions.

The effects of individual differences in intrinsic and extrinsic goal importance on cognitive, affective and behavioural outcomes has recently been examined in the exercise context in a series of studies. First, in developing and validating a measure of exercise goal content Sebire, Standage, and Vansteenkiste (2008, Chapter 3) classified exercise goals for health management, skill development and social affiliation as intrinsic, and goals for image and social recognition as extrinsic. Second, in line with

the central tenets of SDT (Deci & Ryan, 2000; Vansteenkiste, Lens, & Deci, 2006), Sebire et al. (2009, Chapter 4) observed that adults' relative intrinsic exercise goal score (i.e., the degree to which intrinsic goals are more highly valued than extrinsic goals) predicted greater physical self-worth and psychological well-being and less exercise-based anxiety. Individuals' relative intrinsic goal score also positively predicted psychological need satisfaction which partially accounted for the relationships between goal content and physical self-worth, psychological well-being and exercise anxiety.

Given that the pursuit of relatively strong intrinsic exercise goals appears to be able to satisfy psychological needs more effectively than the pursuit of relatively strong extrinsic exercise goals (Sebire et al., 2009, Chapter 4), a logical next step is to try and understand why this is the case. Vansteenkiste et al. (2007; 2008) refer to psychological need satisfaction as a *macro-mediational mechanism* acting between goal content and outcome variables. Further, this group of authors forward the existence of *micro-mediational mechanisms* that represent cognitive-attentional processes that occur during intrinsic and extrinsic goal pursuit, leading to differential psychological need satisfaction. At present, inquiry regarding *micro-mediational mechanisms* represents a gap in the literature concerning exercise goal content. However, potential cognitive-attentional mechanisms have been proposed based on studies of life- and education goals to which the focus of the Introduction now turns.

5.2.2 Effects of Intrinsic and Extrinsic Goal Pursuit: Explanatory Mechanisms

A number of mechanisms have been forwarded to explain the differential effects of relative intrinsic and extrinsic goal pursuit on need satisfaction and well-being. Kasser (2002) suggests that individuals pursuing relative extrinsic life goals may: (a) experience a sense of fragile self-esteem contingently based on their ability to attain their extrinsic goal, (b) experience discrepancies between their actual and ideal self and also become quickly dissatisfied if they attain their extrinsic ideal and (c) devalue interpersonal relationships and behave in ways towards others that will undermine the formation of meaningful connections. In line with these contentions, Vansteenkiste and colleagues (Vansteenkiste, Soenens et al., 2008; Vansteenkiste, Soenens, & Lens, 2007) have forwarded similar reasoning following their goal promotion studies in educational settings. Specifically, pupils primed to pursue extrinsic relative to intrinsic exercise goals are purported to: (a) be distracted from

paying attention to the activity at hand by focussing on attaining external indicators of worth, (b) engage in interpersonal comparisons and (c) impart effort into an activity in a rigid fashion to attain external indicators of worth. These mechanisms do not exist in isolation from one another; rather they are expected to be dynamically interrelated in their satisfaction versus thwarting of the psychological needs for autonomy, competence and relatedness.

The mechanisms proposed by Kasser (2002) and Vansteenkiste et al. (2008; 2007) are informative, however these proposals were formulated on studies of the life-level goals of adults and situationally primed goals in samples of children and adolescents. As such, there is no theoretical basis on which to base the proposal of possible cognitive-attentional mechanisms that might operate within the pursuit of self-selected intrinsic and extrinsic exercise goals in adults.

5.2.3 *The Present Research*

This investigation aimed to explore and understand the lived experiences of exercisers who pursue stronger intrinsic goals relative to extrinsic goals, and of exercisers who pursue stronger extrinsic goals relative to intrinsic goals (i.e., referred to in existing SDT-related literature as *relative intrinsic* and *relative extrinsic* goals, respectively). Such an exploratory approach, which lends itself to qualitative methodology, may facilitate the observation of cognitive-attentional processes that could account for need satisfaction or thwarting during exercise goal pursuit. Further, this work has the potential to identify and refine previously proposed mechanisms from the exercise perspective.

Using quantitative techniques to test previously proposed mechanisms would help to document their relevance to adult exercisers, but would not account for the lived experiences of adults pursuing self-selected exercise goals and may paint an incomplete picture. On the other hand, qualitative research methods afford researchers the opportunity to gain detailed understanding of people's "lifeworlds", through thick descriptions and interpretations of personal perspectives (i.e., experiences of exercise) on which more general explanations of phenomena can be formed (Strean, 1998). Qualitative inquiry is a logical progression of goal content-based research given evidence pointing towards qualitatively different experiences of exercise for those pursuing relatively strong intrinsic or extrinsic goals. In this study we explored the lived experiences of exercisers to begin understanding why the pursuit of goals with different content has been found to be differently related to psychological need

satisfaction, cognitive, affective and behavioural outcomes in adult exercisers (e.g., Sebire et al., 2008; 2009, Chapters 3 and 4 of the present thesis).

5.2.4 Interpretative Phenomenological Analysis

Interpretative Phenomenological Analysis (IPA; Smith, Jarman, & Osborn, 1999; Smith & Osborn, 2003) is a phenomenological qualitative methodology allowing researchers to gain an insider's perspective on an individual's experiences and how they make sense of their personal and social world. As such, in IPA the researcher actively engages in subjective and reflective interpretations, and through this dynamic interaction between the individual's construction of meaning and the researcher's interpretation, a rich understanding of the participant's subjective lived experience is developed (Reid, Flowers, & Larkin, 2005; Smith & Osborn, 2003). IPA facilitates flexible and detailed exploration of the complexities, novelties or processes of a particular experience (Smith & Osborn, 2003) and is therefore appropriate for the present investigation. Further, IPA is a way of supplementing previous quantitative inquiry by exploring operating processes within models (Smith, 1996)¹ and has been previously used to explore health-based (see Brocki & Wearden, 2006) and sport/exercise (see Darker, Larkin, & French, 2007; Gillison, Osborn, Standage, & Skevington, 2009; Lavalley & Robinson, 2007) experiences.

5.3 Method

5.3.1 Sampling and Recruitment

Following institutional ethical approval, participants were recruited from two private fitness centres located in the South West of England. The facilities represented large nationwide health and fitness providers. Members at these facilities either took an envelope containing the study materials situated under a study advertisement or were handed them by the researcher on leaving the facility.

5.3.2 Study Materials

Participants completed an initial questionnaire providing demographic information, frequency, duration, mode and location of current exercise activities and exercise goal content scores. Participants also provided or withheld their consent to be interviewed regarding their exercise experiences.

Exercise Goal Content. Exercise goal content was assessed using the Goal Content for Exercise Questionnaire (GCEQ; Sebire et al., 2008, Chapter 3). The

GCEQ is a 20-item scale that assesses the importance that individuals place on intrinsic exercise goals (i.e., health management, skill development and social affiliation) and extrinsic goals (i.e., image and social recognition) using a seven point likert-type scale anchored by 1 (*not at all important*) to 7 (*extremely important*). In this study, the internal consistency of the subscale scores were; health management $\alpha = .80$, skill development $\alpha = .91$, social affiliation $\alpha = .91$, image $\alpha = .89$ and social recognition $\alpha = .93$. A score reflecting the degree to which intrinsic goals were more important in the participants' exercise goal system was calculated by subtracting the average of the extrinsic goal items ($\alpha = .90$) from the average of the intrinsic goal items ($\alpha = .87$). A positive relative intrinsic goal score indicates that on average, intrinsic goals are rated as more important than extrinsic goals, whereas a negative score is indicative of extrinsic goal dominance.

5.3.3 Participants

130 questionnaire packs were distributed, 63 (48%) were returned and 48 individuals (23 males, 25 females, M age = 39.64, $SD = 12.99$) consented to be interviewed. From the SDT perspective it is important to consider the relative contribution of intrinsic and extrinsic goals to one's overall goal system (Deci & Ryan, 2000). As such, a subgroup of participants was purposefully selected based on an imbalance of their intrinsic and extrinsic goal scores (i.e., intrinsic goals > extrinsic goals; and extrinsic goals > intrinsic goals) derived from the GCEQ. This ensured that the sample comprised information-rich cases with experience of the phenomenon of interest. Purposeful selection was also based the participants' willingness to attend an interview and participants were selected from the sample pool until a good coverage of the experiences of male and female intrinsic and extrinsic goal pursuers was elicited. Eleven participants were interviewed, six (3 male, 3 female) who pursued relative intrinsic goals and five (2 male, 3 female) who pursued relative extrinsic goals. Descriptive characteristics of the sample are presented in Table 5.1.

Ethnically, the participants comprised 8 White individuals and 1 Asian, 1 Afro-Caribbean, and 1 Mixed-race individual. To facilitate the dissemination of findings, intrinsic exercise goal-focused exercisers were assigned pseudonyms beginning with "I" (e.g., Imogen) and extrinsic goal-focused exercisers were assigned pseudonyms beginning with "E" (e.g., Edward).

Table 5.1

Participant Characteristics

Pseudonym	Relative intrinsic goal score*	Age	Gender	Current Exercise Behaviours	
				Mode & Location	Weekly Frequency
Imogen	4.38	25	Female	Gym, running and cycling outdoors	4 to 6 (mixed mode)
Isabelle	1.38	30	Female	Gym, exercise classes, running outdoors	3 to 4 (mixed mode)
Irene	2.21	53	Female	Gym, Pilates (private studio)	Gym; 4 to 5 Pilates; once.
Ian	0.75	33	Male	Gym, running outdoors	4 to 5 (mixed mode)
Ivan	0.96	39	Male	Gym, spinning, swimming	6 to 7 (mixed mode)
Isaac	2.38	48	Male	Gym, home based yoga	Gym; 2 to 3
Emma	-2.00	32	Female	Gym, home stretching/abdominals	Gym; 3 Home; daily
Ellen	-2.71	24	Female	Gym, running outdoors	7 (mixed mode)
Eve	-1.17	21	Female	Gym	Up to 7
Eric	-0.63	24	Male	Gym, football outdoors	Gym; 5 Football; once
Edward	-1.58	22	Male	Gym, football and running outdoors	Gym; 2 to 3 Football; once

Note. * A positive score indicates a relative importance of intrinsic goals over extrinsic goals. The reverse is true for a negative score. (Among all participants who were willing to be interviewed, Imogen and Ellen' relative intrinsic goal scores represented the largest intrinsic and extrinsic scores respectively).

5.3.4 Qualitative Interviews

Semi-structured interviews were conducted by the first author.² An interview schedule was developed to facilitate comprehensive exploration of exercise experiences (Appendix 5.2). Topics included in the initial interview schedule were

derived in part from postulations in the literature regarding the cognitive-attentional processes that might be experienced by intrinsic and extrinsic goal pursuers (Kasser, 2002; Vansteenkiste et al., 2007; 2008) in addition to other areas such as the exercise environment. Previous literature was only used however to guide broad and neutral discussion topics which allowed participants to openly discuss their complete goal pursuing experiences rather than narrowly test theoretical hypotheses. General topics for discussion included the participants' past and present exercise behaviour, their thoughts about the exercise environment and interactions with others within it, experiences during exercise and their goal progress. Following the recommendations of Creswell (2007) the interview schedule was tested and refined through a pilot interview (with a 25-year-old female exerciser). The pilot participant also provided feedback regarding whether the interviewer: (a) facilitated comprehensive discussion of their experiences, and (b) did not lead/influence the participant. The interview schedule guided but did not prescribe the interviews and was refined iteratively throughout the study (Smith & Osborn, 2003).

To establish rapport and provide interviewees with a comfortable environment and the balance of power, interviews were conducted in a quiet location of each participant's choice (participant's home $n = 6$; work place $n = 2$; researcher's institution $n = 3$). Participants were reminded of their right to withdraw and that all information provided was confidential and were given their signed informed consent statement to retain until the end of the interview when they could return it if they consented to their interview being analysed.

Interviews began by asking participants to talk about their current exercise behaviours. Taking prompts from this, interviews continued in a semi-structured manner in which the interviewer posed open-ended questions focusing on topics such as behaviours (e.g., "tell me about what exercise you prefer and why"), thought processes (e.g., "what do you tend to think about when exercising?"), and the meaning of their goals (e.g., "what does your goal for health mean to you?"). Dialogue was allowed to evolve naturally and accommodated new issues raised by participants (Smith & Osborn, 2003). Follow-up probes (e.g., "How did that make you feel?") were used when and where appropriate. During interviews, an interview log-sheet was used to note discussion points and non-verbal cues (e.g., gesture and facial expressions), and reflexive notes were also recorded post-interview (Patton, 2002) (Appendix 5.3). Following interview, participants were debriefed. Interviews were

recorded using a Sony ICD-MX20 digital dictaphone and lasted on average 42 minutes (range = 27 to 61 minutes).

5.3.5 Data Analysis

Interviews were transcribed verbatim, including instances of inaudible speech and significant pauses. Transcripts were then read while simultaneously playing the audio files to screen for transcription errors. Qualitative analysis software (Atlas.ti; Version 5.2.18) was used to facilitate the analysis (i.e., organising transcripts, aiding consistent coding, retrieval and linking, comparison of extracts and consolidation of reflective remarks, field notes and memos). Transcript analysis closely followed the conventions of IPA (Smith et al., 1999). Each transcript was read a number of times to ensure familiarity with the content, and was then subjected to individual interpretative analysis. To this end, the first transcript was populated with initial codes, themes and comments. These data were exported to a list of themes as they occurred in the transcript and then were interpreted and analysed for connections between them to form higher-order clusters. Data were clustered based on similarity of content and similar/divergent participant experiences of the same phenomena (e.g., interacting with others). At this stage the theme remained flexible and malleable to development depending on the new data. These higher-order clusters were given preliminarily theme names based on their content and were exported to a master list. The preliminary themes formed a framework with which the next transcript was analysed. Emergent codes and themes from the second transcript, not aligned with pre-existing themes formed new preliminary themes and were added to the master list. This process was repeated for the remaining transcripts. The analysis was iterative and all transcripts were re-analysed for instances of new thematic occurrences and previously defined themes were continually refined (Smith et al., 1999). Commensurate with the recommendations of Elliot, Fischer, and Rennie (1999) in order to enhance the credibility of the themes, analyst triangulation (Patton, 1999) was employed whereby transcripts were analysed by a second researcher. Results were discussed and while absolute consensus was not the objective, interpretations of interview content, including discrepancies, rival explanations and exploration of negative cases lead to theme development and refinement (Patton, 1999). Back checking with interview transcripts ensured that themes were grounded in the primary interview data.

5.4 Results

Five themes emerged which were classified into two broad domains. Domain 1 was labelled *Social factors* and comprised the sub-themes of *Observation of others and Emotions following observations or interpersonal comparisons*. Domain 2, *Goal pursuit*, comprised the sub-themes of *Expectations and beliefs*, *Markers of progress*, and *Reactions to (lack of) goal achievement*.

5.4.1 Domain 1: Social Factors

Theme 1: Observation of others.

Most participants reported interactions with others during exercise either by observing others' workouts or by making specific interpersonal comparisons. Social comparisons reported by intrinsically goal-driven exercisers were generally upward and focused on the workout, skill or fitness level of the comparison target. For example Isabelle said:

I might look at someone and go "Oh are they more fit than I am, or less fit than I am?" But it's not something that I would dwell on, 'cause for me exercise is more about what I'm getting out of it, not about the people around me so much.

For Isaac, similar observations played a role in developing his own exercise program:

Just observing what they do and I'll think about their routine, are they doing sets? Are they doing certain machines? And I just pick things up and add it into my over all repertoire of exercise.

It is interesting to put this in the context of Isaac's development as an exerciser; while clearly currently valuing goals for health/fitness he recalled previously making appearance-based comparisons when he initiated exercise. However, he also recalled making a conscious decision to cease such comparisons, feeling they were detrimental to his achievement:

When I started going back to the gym back in um as I said, in March 2004, I was doing that [comparing his appearance to others] a bit and I thought: "This is a waste of time, there's no point, just do my own thing but learn from them at the same time." But don't let how well they are doing undermine my confidence or stop me progressing to the next level of fitness.

Observations of others' fitness were a source of inspiration for Imogen, a keen exerciser:

You know sort of "bloody hell what level are they on?" You know? And you'll have a look and they're on like level 20 on the treadmill...So it's more sort of "wow" as apposed to "humph" you know? They're like you know faster than me or slower...It's never like a direct comparison to myself ... it's more kind of like in awe of [what] those people are doing.

For some intrinsic goal-oriented exercisers, interpersonal comparisons with other exercisers were unimportant. Ivan associated this explicitly with his health-based exercise goal, and could not understand exercising for appearance enhancements:

I don't care about what anyone else is doing, I'm only interested in what I'm doing because I have to for my health. So I'm just not ... if someone else is doing it because their goal in life is to have great big guns on their arms and you know, or their goal is to have that ... the elusive vein in their bicep which you see chaps talking about that and you think "mmm, OK, yeah fine."

Interpersonal comparisons reported by the extrinsic goal pursuers were largely based on appearance rather than workout content or fitness and were also linked to social recognition. Upward appearance-based comparisons were integral to Edward's experiences, although he did not think that his behaviour was acceptable:

It's a bit naughty really, but yeah you do look at other people and think things...So like, I do look at people and think "I want to be like you", like. But I don't want to be a muscle man.

Edward's optimum appearance is a balance between being muscular and too muscular; he believed that this was something other people have achieved and he aspired to such goals. For Ellen, appearance-based comparisons were related to her evaluation of whether she will gain the social recognition she desires:

If there's a girl on the cross-trainer that's you know quite attractive and, you know maybe more attractive than me kind of thing, I do get sort of a little bit, I dunno really ... I don't like it so much because I know like if someone, if there was a guy walking across the top [a raised walkway] he'd probably notice her rather than me.

Eric recalled a very similar experience and was concerned that exercising adjacent to others he perceives as attractive reduced opportunities for social recognition:

If you're exercising by two gorgeous girls, someone who's quite stacked... a couple of um you know nice personal trainers, then your gonna want to be a bit more presentable and maybe have a, I don't know, increase your appearance a little bit ... Like trying to outstage the other person or trying to look better than the other person.

Theme 2: Emotions following observations or interpersonal comparisons.

There was consistency among the intrinsic goal-focused participants that their evaluations of others' fitness as greater, or exercise regime as more advanced than theirs did not evoke perceptions of personal failure or inferiority. Rather, participants largely converged in accepting their level of fitness compared to others and focused on self-referenced improvements. Isaac said:

I don't see it as better or worse, I see it as um trying to do the best I can with the potential I have sort of thing. So yeah, there are always people who are able to lift up heavier weights than you, there are people always able to row 1000m in three minutes or less there are always people that can cycle fast, it's always the case but I don't feel that they are better than me and feel worse about it, because there are always people fitter than you. But I try to make sure what I do is um, um the best that I can.

Imogen echoed this perspective:

I'm quite willing to accept that there's lots and lots of people, that I'm not at my optimum fitness and there are lots of people that are much fitter than me.

It is of note that Imogen changed her frame of reference mid-sentence from referring to other peoples' fitness being greater, to her fitness being below *her* optimum level. Isabelle was a somewhat deviant case within this theme because although she reported fitness-based upward comparisons she felt anxious of fitter others negatively evaluating her fitness and self-conscious around such people. Despite this, she positively evaluated her own health and commitment:

There's an incredible number of very fit people that go to the gym so, who are sort of, I consider myself healthy I'm not sure I would consider myself sort of uber fit, um and so I would feel very self-conscious around people who were very fit 'cause I'd think they were thinking "oh my goodness she doesn't work out enough" [laughs]. Well I think I go quite a bit.

The emotions of the extrinsically goal-focused exercisers following interpersonal appearance-based comparisons were somewhat different. Ellen said:

If they're smaller than me and they look good I obviously I do feel a bit jealous about that um but I've come to realise, I know there are some naturally really slim people, but to be that slim it's probably unnatural really. They would have to put them[selves] through a lot of exercise.

Ellen's upward appearance comparisons caused jealousy, however it seems that it is not only size that matters; the comparison target must also look good. She also seemed to employ a coping strategy perhaps in hope of alleviating the negative emotions associated with her interpersonal comparisons. Ellen continued:

I do feel good like if I think that, you know I've got a better figure than someone um ... really good [quiet laugh] but yeah, but then I think that that is a bit terrible.

Her account suggested that for her, downward appearance comparisons yielded more positive emotions than upward comparisons. However, the resulting positive emotions were short-lived and followed by feelings of guilt. Emma reported that comparisons with the specific body parts of others led her to doubt her competence and left her feeling jealous:

Sometimes I'll wonder "oh I bet when she walks her legs never touch, I'd like to have that" you know, "I've never attained that...will I ever?" that kind of thing...Am I jealous? Well yeah of course [sighs] you know, coveting thy neighbour's legs.

Both Emma's and Ellen's accounts portrayed an internalisation of socio-cultural ideals of appearance and they believed that upward appearance-based comparisons would certainly result in jealousy. Eric reported similar experiences and emotions:

I bet subconsciously I am thinking, "I'm bigger than him" like you know "great" and that gives you that feeling of self-fulfilment. And like, you do envy guys who have got that physique. I'm sure that when I get big headed and bigger I'm sure that there will be a lot more people that I'm... hopefully, that are not as big as me, so [laughs].

Eric claimed that the downward comparisons he made were not deliberate and he was reluctant to admit comparing his appearance favourably with other male exercisers. Similar to Ellen, Eric found downward comparisons self-fulfilling but felt envious

following upward comparison. He also aspired to have a more muscular physique even though he believed this would bring arrogance. Being more muscular may lead Eric to make less frequent upward comparisons and more self-fulfilling downward comparisons. However, his desire to be recognised for his appearance led to conscious decision-making as to the public/private nature of the setting in which he exercised:

Yeah round the corner a little bit, it's best of both worlds there so it's perfect really because there's a balance between like being seen there and that, and also having the privacy too.

Collectively, the experiences of Ellen and Eric were characterised by a set of emotional responses during exercise which appear to depend on a number of factors that are out of their control for example the level of privacy, attention/comments from others, and presence of those of lower or higher attractiveness.

5.4.2 Domain 2: Goal progress

Theme 3: Expectations and beliefs.

Many intrinsic goal-focused exercisers expected to achieve their goals and often expressed this as a belief that their behaviour would lead to long-term positive outcomes. For example Ivan said:

You know that if you are doing it [exercising] then everything is going to be fine anyway.

A similar long-term perspective was held by Irene who believed that there were no short-cuts to achieving her goals:

I'm much more aware of any aches and pains and why I've got an ache or a pain, and I know there is probably something you can do to get rid of it but it's quite a long haul, um, it's not a quick fix.

Ian was also committed to exercise in the long-term and was confident in coping with the fluctuations in fitness and body weight that he acknowledged was part of his long-term perspective:

If I come back [from a break from exercise] and I put weight on or I take a bit of time [off from exercise] or my fitness levels drop um then ... you can come back to it and you just have to work a little bit harder to get back to where you were.

The exercisers pursuing relative extrinsic goals spoke less confidently of their ability to achieve their goals. Further, in referring to goal attainment, there were more reports of particular end points and fewer references to ongoing processes. Emma said:

A certain dress or skirt or pair of jeans or trousers or something that I'd like to get back into and once I can then it'll sort of, it's much nicer... It's not something that's this "never will I attain what I want", I probably never actually will.

Emma's contradiction infers a lack of confidence in her ability to achieve her goal. It suggests that she is experiencing a conflict between a strong desire to believe that it is possible to achieve her ideal body shape through her exercise behaviours, and the acceptance that in reality, her goals may be unattainable. Eve has also set herself unachievable appearance-based goals although she is committed to achieving them to display her ideal body to others:

I know what I want my body to look like, not that I think I'm going to achieve it, but as much as I can I will try, 'cause those are the body parts you expose the most. I know like I'm not exactly aiming for a 6-pack but getting a nice flat stomach or whatever.

Not all extrinsic goal-focused participants doubted their ability to achieve their goals; the two male participants reported goal progress. For example, Edward said:

Since Christmas like I have lost quite a bit, a bit of weight so I'm quite happy with myself.

Theme 4: Markers of progress.

The participants focused on relative intrinsic goals consistently discussed a range of inwardly orientated criteria when evaluating their goal achievement, which appeared associated with their preferences for- and effort expended during exercise. For example, many intrinsic goal-focused participants' experiences were characterised by monitoring their goal progress in relation to feeling that they have exerted effort during an exercise session. Imogen said:

My body just tells me that I am [progressing] in terms of you know...I know if I push myself...I know if I, every time I sort of build on...every time I try to improve a little bit...every time I go I try and sort of do a harder setting or just get my heart rate up a bit higher and I know that will...you know... contribute to my overall, I think it is all sort of gradually sort of getting there in terms of getting fitter and getting stronger.

Imogen's focus on the physical elements of exercise as markers of progress seemed related to her attention also being oriented inwardly during exercise and she inferred a preference for improving herself:

I really work hard on trying to get my heart rate sort of above 160 and try to keep it up there and then trying to get periods of sort of getting it above 180 and you know really trying to get...you know. 'Cause I've only got sort of an hour and a half everyday really in there, so it's really about kind of getting the absolute maximum out of that sort of little time, um, time frame in order to build on my fitness.

Like Imogen, Ian also reported an inward attentional focus during exercise:

I'm constantly looking at, measure my breathing pattern, I'm constantly concentrating on that.

Ian also reported attending to bodily sensations for feedback on goal progress which facilitated a flexible approach to exercise:

I just sort of see how I feel in myself, if I do feel right then I'll go more, if I don't, then I won't I'll just stay.

The flexible approach to evaluation of goal attainment revealed by the exercisers focused on intrinsic goals was not echoed by the extrinsic goal-focused exercisers whose narratives were characterised more by self-presentational means of assessing their goal progress. For example both Eric and Eve spoke of closely monitoring the appearance of their body parts that are visible to others, Eric said:

Mirrors, just looking at yourself um...face, belly, those main two areas where sort of fat tends to show more visibly to other people. So obviously that's the maybe the reason obviously I exercise is the appearance thing... kind of when you're on the beach [laughs].

In contrast to the intrinsic goal-focused participants' preferences for hard work, Eric sought large and immediate rewards for the least effort expended, which guided his choice of exercise:

I want to be bigger in my upper body like, [with weights] you do notice bigger gains in like appearance in a shorter time.

This desire for instant rewards stands in contrast to the more long-term perspective held by the intrinsically goal-oriented individuals. Emma also used body shape evaluation as a marker of goal progress and her perspective closely echoed Eric's:

...well I like weights...I think weights are good...They are good for sort of toning and making sort of...not an immediate...but a fairly immediate difference in terms of how your body is shaped... Yeah they're very easy, they're fine, I can sit back and relax ... I don't like cardio simply because I'm a bit lazy and cardio is quite an exerting thing to do.

Eve used the comments of others to evaluate her goal progress but did not appear to trust her own judgment, or consider her own judgement as sufficient to signify goal achievement when she sees changes in her body shape:

I feel like yeah I know that my hard work is paying off and if other people can see it then maybe I am achieving it, you know? Sometimes I make myself not try to believe it... when I look in the mirror and think "oh I've lost weight" but then I try to think "no wait a minute" like "don't think too much about it". But then I'll wait for when someone else comments or comes and tells me and I feel like um if they can notice it.

Such suppression of self-praise may lead to an unstable self-perception as Eve faces uncertainty as to whether other people will provide the positive comments she desires. It also suggests her ultimate goal may not be to be slim itself, but to be recognised by others for being slim. It is interesting to compare what Eve concentrates on during exercise to a relative intrinsic goal exerciser such as Imogen. While Imogen reported aiming for a high heart rate or general feelings as indicators of goal progress, Eve's approach appears to be rigid calorie counting which was occasionally destructive.

I mostly watch like, aim to do like 250 calories on the stepper, 250 calories on the cross-trainer that's 500 and then 200 calories on the treadmill, that's about 700 calories on the cardio bit ...There are days when I will look at the calorie thing and think "oh man", and then like I look

at the calories and I think “oh shit” like. And then most often than not I’ll just step off and say “oh I really can’t be arsed” kind of thing.

Ellen based her evaluation of exercise goal achievements on others’ perceptions of her appearance and whether other women envied her figure. She acknowledged that this was not socially acceptable and inferred that she felt guilty about this. Ellen said:

I think like to have other women like envy ... my figure gives me, I know that sounds really awful but ...no it gives me sort of like, yeah I, you know, I’ve managed to, you know, I’m slim I’ve managed to do this. And they may feel a bit jealous about that and in a way that makes me feel a bit quite good about it.

Theme 5: Reactions to (lack of) goal achievement.

Both groups of exercisers experienced progress in their exercise goal pursuits, however the nature of the emotions and actions experienced following such progress differed between relative intrinsic- and relative extrinsic goal-focused exercisers. Intrinsic goal-focused participants reported a number of positive emotions. For example, Isabelle was proud of recent self-referenced improvements:

A few weeks ago I ran at a much higher pace for me on the treadmill for half an hour and it was a pace that I had never done before so I was so proud of myself.

Isaac reported positive emotions following goal achievement and then sought new challenges:

I mean it’s a general feeling of elation really and um just a real sense of confidence and satisfaction you know. But I mean obviously you stop and move on to the next um exercise routine ... I tend to move it up a notch yeah.

Similarly, when Isabelle felt that she was not attaining her exercise goals she adapted her routine:

I do try to switch it up and try new things if I feel as though I’m not getting the kinds of results.

Irene and Ivan also recognised the possibilities of continued achievement and spoke clearly of the process of exercising:

Irene: There's always something you can do even if it's just, you know, maintaining flexibility and keeping your muscles going.

Ivan: I feel it's just, it's done and that's it 'cause I don't see it as a goal that you then, like someone would with weight loss they'd go "right I've got down to my target weight, now what?" I don't ever get to that because I know that with my health its ongoing, do you know what I mean?

Goal achievement for the extrinsic goal-focused exercisers was also associated with positive emotional responses:

Emma: Makes me feel more confident in my appearance...I want, you know, I want to look good in what I'm wearing and I want it to fit.

When asked what she would do if she was not successful in her appearance-based exercise goal pursuit, Emma said:

Liposuction...you know save up for plastic surgery (laughs)...I don't know, I don't want to think about that...um, because I don't think that it's impossible to achieve.

Emma's approach appears different to that of the experiences of the intrinsic goal-focused exercisers who firstly accepted that sometimes exercise does not always bring the desired results, and secondly indicated that they would persist and try changing their routine to achieve their goals. Edward indicated that achieving his goal of improved appearance resulted in happiness, however also suggested that such happiness was an uncertainty:

As long as I look good I'm happy I suppose...I spose if I'm happy, like you can't really stop can you? You've got to keep working otherwise it just turns to flab and that. Um, I'm not really sure when I'll be happy, so.

Edward's positive emotions following goal progress were fleeting, and similar to many of those focused on extrinsic goals he reported negative emotions related to a

sense of self-imposed pressure to maintain his achievements and avoid returning to his previous appearance. An extract from Ellen portrays a very similar experience:

I feel good but then I feel, I panic 'cause I feel "oh god, right I'm there I've got to keep it there, I can't let it slip" kind of thing. You know, 'cause once you've, you can't get to a target weight you can't put all that effort in get to a target weight and then just say "oh I got there now" and let it all go. Otherwise, you know, you've got to maintain it.

5.5 Discussion

In the present study we sought to qualitatively explore the experiences of adults exercising towards relative intrinsic or relative extrinsic goals as defined in SDT (Deci & Ryan, 2000). Our aim was to uncover possible cognitive-affective processes that might account for the more adaptive psychological and behavioural outcomes identified in those that pursue intrinsic versus extrinsic goals for exercise. Through the analysis of qualitative data, two broad domains were identified that both contained subthemes which highlighted differences in the experiences of intrinsic and extrinsic goal-focused exercisers. The first domain *Social Factors* consisted of two themes; *observation of others* and *emotions following observations or interpersonal comparisons*. The second domain was labelled *Goal Pursuit* and consisted of themes of *expectations and beliefs of goal achievement*, *markers of goal progress*, and *reactions to (lack of) goal achievement*. A summary of the evidence pertaining to the divergent experiences of similar higher-order themes from the narratives of the exerciser focused on relative intrinsic and relative extrinsic goals can be found in Table 5.2.

The exercisers' narratives provide a rich insight within the exercise domain into the processes by which relatively strong intrinsic or extrinsic exercise goals may influence need satisfaction and cognitive, affective and behavioural outcomes. Further, the data supports, refines and extends previous postulations by SDT researchers (Kasser, 2002; Vansteenkiste, Soenens et al., 2008) regarding macro-mediational mechanisms.

Table 5.2

Schematic Overview of the Experiences of Relative Intrinsic and Relative Extrinsic Goal-Focused Exercisers

	Relative intrinsic goal-focused exercisers	Relative extrinsic goal-focused exercisers
Domain 1: Social factors		
Theme 1: <i>Observation of others</i>		
Number or volume	Smaller number	Higher number
Reason	Learning from others	Proving oneself relative to others
Focus	Health-related criteria	Appearance-related criteria
Theme 2: <i>Emotions following observations/comparisons</i>	Vitalising / inspirational	Deflating / jealousy / self-doubt
Domain 2: Goal pursuit		
Theme 1: <i>Expectations of achievement</i>		
Time perspective	Long-term	Quick-fix / immediate results
Confidence	High	Mixed – generally low
Theme 2: <i>Markers of goal progress</i>		
Evaluative criteria	Process-based criteria (effort & bodily sensations)	Outcome-based criteria & contingent reaction of others
Approach	Flexible	Rigid
Theme 3: <i>Reactions to (lack of) goal progress</i>		
Achieved goals	Lasting positive affect	Short-lived positive affect & pressure to maintain
Non-achieved goals	Accepted, adapt routine & persist	Drop out

5.5.1 Social Factors

Although both the intrinsic- and the extrinsic goal-focused individuals were engaging in comparison processes while observing others, these comparisons seemed to differ in a number of ways, including: (a) their volume or number, (b) their underlying reason and (c) their focus. These are now discussed in greater detail.

Exercisers pursuing relative intrinsic goals and those pursuing relative extrinsic goals reported making observations of others and interpersonal comparisons although these were more prominent in the extrinsic goal-focused exercisers' narratives. The greater volume of social comparison (both upward and downward) by the extrinsic goal-focused participants seemed linked to self-presentational concerns (e.g., Eric's preference for the optimal balance between being too visible to others and not visible enough). Such findings align with the proposals of Vansteenkiste et al. (2008) that extrinsic goal pursuit is characterised by a greater volume of social comparison and a shift of attention away from the activity at hand which may prevent exercisers from fully immersing in the sensations of exercising.

Our findings highlight that the volume is only one dimension of interpersonal comparison that may differ between exercisers focused on intrinsic and extrinsic goals. Specifically, the focus of- and reason for engaging in interpersonal comparisons appear worthy of consideration. The particular focus of the comparisons made by the participants appeared guided by the content of their exercise goals. For example, exercisers aspiring to extrinsic goals often spoke of appearance-focused comparisons which were perceived as socially unacceptable and were often accompanied by feelings of shame and incompetence. Social comparisons were not reported by some intrinsic goal-focused exercisers, whereas others reported comparisons focused on components of fitness which were in most cases inspirational.

In terms of the reason for interpersonal comparison, the intrinsic participants' comparisons appeared to be motivated by the desire to learn about the routines of other exercisers in order to enhance their own routine and more effectively work towards their goal. Such comparisons appeared to stimulate exercisers to increase their workout difficulty or attempt new skills, creating opportunities to experience competence and autonomy through pursuit of personal challenges. This was evident in Isaac's experience (e.g., "I just pick things up and add it into my overall repertoire of exercise"). In contrast, the interpersonal comparisons reported by the extrinsic goal-

focused exercisers seemed to be characterised by the gathering of information about their progress towards their extrinsic goal relative to others (e.g., a more toned figure).

It is likely that aspects of comparison processes such as the volume, reason and focus are related to the emotions following such comparisons. Drawing on Festinger's (1954) theory of social comparison, Wood (1989) forwards a possible explanation for why the social comparisons made by the intrinsic and extrinsic exercisers produced different emotional effects. Wood proposes that if a comparison target is perceived as a competitor or a challenger, an upward comparison will yield aversive outcomes, whereas if the target is perceived as a non-competitor, upward comparisons are likely to be inspirational or irrelevant. Owing to the focus of the extrinsic goal-focused participants on social recognition and physical attractiveness, they might view comparison targets as competing for attention or for the ideal appearance within their exercise environment. Eric and Ellen clearly indicated that this was part of their exercise experience. Those pursuing relative intrinsic goals however reported being comfortable with their level of fitness compared to fitter others, suggesting that they did not perceive their comparison targets as competitors. Perceiving others as competitors is likely to induce feelings of stress which may be autonomy thwarting and may reduce feelings of relatedness among extrinsic goal pursuers and others. Additionally, if comparisons are competitive, and the target is perceived as having achieved the exerciser's desired state the comparisons may lead to decreased perceptions of competence.

An alternative perspective would suggest the contrasting inspirational versus deflating impact of the comparisons made by the intrinsic and extrinsic goal pursuers respectively may be due to their belief that they can achieve what they compare to (Lockwood & Kunda, 1997). It is clear that Emma's social comparisons were unfavourable and resulted in her doubting her ability to achieve the same slender legs as her comparison target, whereas Isaac's comparisons were favourable and he confidently added new exercises demonstrated by fitter others to his routine. Lockwood and Kunda (1997) observed that when an upward comparison to a "superstar" target was perceived as unattainable, the inspiring effects of the comparison were undermined.

Kasser (2002) forwarded that strivings for extrinsic goals may lead to the perception of discrepancies between the actual and ideal self. Extending this to the present context, discrepancies between their actual and ideal body shape were clearly

felt by Edward and Emma. Actual-ideal discrepancies are likely to thwart feelings of competence. In addition, the comparisons made by the extrinsic goal-focused exercisers, motivated by a desire to compare their extrinsic goal attainment with others, resulted in jealousy and at times doubt in their ability to attain their ideal (e.g., Emma: “oh I bet when she walks her legs never touch, I’d like to have that you know? I’ve never attained that...will I ever?”).

Kasser (2002) further proposed that those pursuing materialistic life goals were likely to objectify others and devalue interpersonal relationships thus threatening the satisfaction of relatedness. There was little direct evidence of this in our interviews, however when engaging in social comparison, some extrinsic goal exercisers reported reducing themselves and other exercisers to a collection of separate body parts (i.e., slender legs, muscular arms), each with their own appearance, rather than seeing the whole of the person. This indirect evidence of objectification seemed associated with feelings of envy which may prevent the development of interpersonal connections. In addition, some participants implied that they used another exerciser’s appearance to bolster their own opportunities for social recognition. For example neither Ellen nor Eric liked to exercise next to females more attractive than themselves for fear of this reducing the attention afforded to them from others. The narratives of some extrinsic participants highlighted that they sought relatedness. For example, Eric’s aspired to be more muscular and therefore associated with other muscular men. However, paradoxically their attempts to do so appeared unlikely to optimally facilitate meaningful relationships; Eric hoped that group membership with other muscular males would also alienate him from less muscular exercisers.

5.5.2 Goal Progress

Exercisers who pursued relative intrinsic and those who pursued relative extrinsic goals reported different experiences with regards to: (a) their expectations of goal attainment, (b) how they assessed their goal progress and (c) their emotions experienced on goal attainment. These themes are now discussed.

Some extrinsic goal-focused exercisers reported focussing their assessment of progress towards their goal on certain end-points such as fitting into a favourite item of clothing or reaching a certain muscularity. However, these individuals displayed a lack of belief in their competence to achieve these goals. Such set end-points of exercise engagement may be create a vulnerability to develop what Vansteenkiste et al. (2005) called a rigid approach which was proposed to account for reduced

conceptual- but equally high rote-learning observed in school pupils pursuing extrinsic versus intrinsic learning goals. The extrinsic goal-pursuing exercisers in the present study also reported attending to rigid standards during their workouts (e.g., Eve's counting of a predetermined number of calories) and selected exercise activities that gave the greatest goal attainment in the shortest time. It was clear from Eve's experiences that focusing on a set number of calories could be discouraging to the point of giving up mid-workout if the calories did not burn quickly enough. This rigid approach was not evident in those who valued relative intrinsic goals, who in contrast reported that their attention was largely focused on components of their own workout (e.g., breathing pattern, heart rate, mastering a technique).

The participants also differed in their reactions and actions following goal achievement or a lack thereof. Extending Vansteenkiste et al.'s suggestion of a rigid approach, the extrinsic exercisers' focus on particular end states appeared linked to a "what next?" question following goal achievement, which was associated with a self-imposed pressure to maintain their achievements. This observation is strikingly similar to the experiences of some high frequency exercisers documented by Cox and Orford (2004) and such pressured continued engagement may be to the detriment of autonomy need satisfaction. In addition, when facing a lack of goal achievement Emma's suggestions of turning to other more drastic means of achieving her goals for a slender appearance (i.e., liposuction or plastic surgery) appear quite closely related to the perception of exercise as a minimum input, maximum reward activity, or quick fix by the extrinsic goal-focused participants.

Consistent with past qualitative work (Bamber, Cockerill, Rodgers, & Carroll, 2000) a more flexible and long-term approach towards exercise was reported by the intrinsic goal-focused exercisers in which unsuccessful workouts or breaks in routine were acknowledged as part of the "long-haul" process. Unlike the extrinsic goal-focused exercisers, these exercisers believed that they could achieve their goals and showed persistence in the face of slow progress. The intrinsic goal pursuers also reported setting new challenges following goal achievement and did not report "what next?" cognitions. Such experiences are likely to enhance perceptions of competence and autonomy alike as it appears that these participants have identified with and accepted "long-haul" process as part of exercise.

The relative intrinsic and relative extrinsic goal exercisers in this study reported using different markers of goal progress. Exercisers with an intrinsic goal-

focus did not use or seek social recognition to measure their goal progress although some found positive comments from others during exercise a pleasant by-product. Many reported being aware of and content with their level of fitness, and monitored their progress in exercise using self-referenced feedback rather than contingently upon the comments of others. This finding adds support at the individual difference level to the experimental findings of Vansteenkiste, Matos, Lens, and Soenens (2007) that extrinsic goal framing undermines, whereas intrinsic goal framing promotes task involvement (i.e., self-referenced criteria of achievement). As such, the intrinsic goal-focused exercisers self-worth appeared less contingent and more stable. The flexible approach towards goal progress and task focus/self-referenced evaluations of the intrinsic goal-focused exercisers may have adaptive effects on need satisfaction as evidence from the sport context suggests that task-involving motivational climates support the three needs for autonomy, competence and relatedness (e.g., Reinboth & Duda, 2006).

In contrast, those pursuing extrinsic goals reported using respect, social recognition and comments from others as indicators of their goal progress. This desire for respect has been similarly observed in exercisers focused on appearance change (Cox & Orford, 2004). Commensurate with the experiences of Cox and Orford's participants, the exercisers in the present study appeared uncertain as to whether such comments would be forthcoming and if they were, whether they would be positive or negative. Such practice is unlikely to provide the feedback regarding goal achievement that these exercisers desire.

The extrinsic goal-focused exercisers also appeared to hinge their self-worth upon goal attainment (e.g., Edward: "As long as I look good I'm happy I suppose..."). Consistent with Fromm's (1976) "having" mode (e.g., "I am what I have"), Kasser (2002) proposed that lower well-being scores documented in those pursuing extrinsic life aspirations may be due to their self-worth being contingently based on their possessions and status rather than aspects of their true-self. Such practices may contribute to a fragile sense of self-worth (Patrick, Neighbors, & Knee, 2004). Eve's narrative provided a good example of this as she reported preventing the formation of more stable self-esteem by denying her exercise accomplishments until they were noticed- and commented upon by others. Such practices are likely to lead to thwarted competence need satisfaction as evidence for one's competence resides with others until they provide support for goal attainment. Relying on other people for such

feedback may also be detrimental to relatedness need satisfaction as close connections with others are unlikely if their comments are not forthcoming or complimentary. It was also evident that if participants' self-worth was contingently bolstered via goal achievement (i.e., looking good, meeting a target weight or receiving favourable comments) they felt a pressure to protect their self-worth by maintaining their exercise based gains. Such pressure may be antithetical to perceptions of autonomy.

5.5.3 Limitations and Future Research

There were a number of limitations to the present study. First, the experiences analysed reflect only those of the 11 participants interviewed and transferability to other exercisers should be performed with caution. Limited generalisability is a constraint of purposeful sampling (Patton, 1999) however such methods facilitated our exploration of the relevant experiences of information-rich cases. A sampling bias may also exist given that there were a number of participants who demonstrated a higher relative extrinsic goal score than those interviewed in the present analysis but these participants either refused- or volunteered to be interviewed and then withdrew from the study. A second and related limitation is the smaller number of extrinsic goal-focused males. This reflects a difficulty in recruiting such individuals for interview. It could be that exercise based self-presentational issues such as appearance control and social recognition goals may be viewed by males as more female-oriented domains which they are reluctant to discuss openly. Despite the need for further research using male samples, many of the experiences of the male extrinsic goal-focused exercisers echoed those that characterised the extrinsic goal-focused female exercisers' narratives.

A number of avenues for future research have emerged from this study. Given that both the intrinsic and extrinsic goal-focused participants reported engagement in regular exercise, one question raised in the present study is whether extrinsic goal pursuit always has negative behavioural consequences? In other words, if an individual is regularly exercising, does it matter what their goals are? The interview data analysed suggests that exercise goals do matter by speaking to issues pertaining to the quality rather than the quantity of exercise engagement. While the experiences of the exercisers pursuing intrinsic goals referred to enjoyment, challenge and flexible engagement, the experiences of the exercisers striving for extrinsic goals were characterised by rather negative cognitive-affective experiences. Such experiences may make short-term exercise participation unsatisfying and could negatively

influence long-term commitment. Future research would do well to investigate longitudinally whether some of the experiences of exercisers highlighted in the present investigation serve to mediate the effect of exercise goal content on long-term exercise behaviour. The qualitative methodology employed in the present study would be useful in future studies concerning the development of intrinsic and extrinsic goals for exercise. The detailed narratives that qualitative methods facilitate would help researchers to build a solid foundation of phenomenological data. Such rich data could be combined with more quantitative approaches into logical and detailed person-centred mixed-methods analysis of intrinsic and extrinsic goal antecedents.

Future research may also address more maladaptive behavioural practices (i.e., eating disorder symptomology, exercise dependence, and misuse of diet pills, steroids or supplements) which may manifest alongside the exercise engagement reported by the relative extrinsic goal-focused exercisers. It would also be informative to consider how components of other theoretical perspectives might help to further explain or consolidate the present findings. For example, the narratives of the participants pursuing extrinsic goals suggested that they had internalised socio-cultural ideals of appearance and engaged in frequent social comparisons. As such, concepts from objectification theory (Fredrickson & Roberts, 1997), social comparison theory (Festinger, 1954) and the thin-ideal internalisation and body dissatisfaction literatures (Thompson & Stice, 2001) might be particularly informative when combined with SDT to further understand explore the goal content perspective.

5.6 Conclusion

In conclusion, the present study has painted a more detailed picture than before of the experiences of exercisers striving towards relative intrinsic- and extrinsic exercise goals as defined in SDT. The flexible and largely positive experiences of the intrinsic goal-focused exercisers appeared to be much more adaptive than those focused on extrinsic goals which were often stressful and related to maladaptive emotions. The personal experiences of the exercisers have identified, elaborated and refined in the exercise domain mechanisms that may explain the previously documented correlates of intrinsic and extrinsic exercise goal pursuit. Given the marked differences in the narratives of the exercisers that appear linked to the content

of their exercise goals, intrinsic and extrinsic exercise-based goal content and related cognitive and affective experiences may be important to consider in future research.

5.7 Footnotes

¹ SDT was used as an over-arching framework and the basis for the classification of goal content rather than an interpretative constraint. In line with Smith and Osborn (2003) using semi-structured inquiry we aimed to explore the “complexity, process or novelty” (p. 53) of a particular experience rather than test SDT-based hypotheses.

² Sources of researcher bias that may influence the credibility of qualitative data should be acknowledged by describing the researcher’s characteristics (Brocki & Wearden, 2006; Elliott et al., 1999; Patton, 1999). The first author (SJS) conducted interviews and transcript analyses. SJS is a 26 year old White British male who is a regular exerciser and former fitness instructor/personal trainer. SJS has a sound knowledge of SDT and its application in the exercise context and has undertaken training in interview techniques. The third author (FBG) performed transcript analysis and interpretation of data. FBG is a White British female chartered health psychologist, has a detailed knowledge of SDT and exercises regularly.

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CHAPTER 6

Predicting Objectively Assessed Exercise Behaviour from the Content and Regulation of Exercise Goals: Evidence for a Mediation Model

Predicting Objectively Assessed Exercise Behaviour from the Content and Regulation of Exercise Goals: Evidence for a Mediation Model

6.1 Abstract

Guided by self-determination theory (Deci & Ryan, 2000), this study aimed to examine effects of the content and regulation of adults' exercise goals on objectively assessed exercise behaviour. One week after reporting the content and regulation of their exercise goals, 101 adult participants (M age = 38.79; SD = 11.5) wore an ActiGraph accelerometer during waking hours for seven consecutive days. Accelerometer data were analysed to provide estimates of engagement in moderate-to-vigorous physical activity. Building on previous work, mediation analysis revealed that the importance placed on intrinsic versus extrinsic goals for exercise had a positive indirect effect on average daily moderate-to-vigorous physical activity, average daily moderate-to-vigorous physical activity accumulated in bouts of 10-minutes and the number of days on which participants performed ≥ 30 minutes of moderate-to-vigorous physical activity through autonomous motivation. These results add support using objective measures to previous observations of a motivational sequence in which exercise goals influence behaviour via exercise motivation.

6.2 Introduction

Owing to epidemic levels of physical inactivity, overweight and obesity (World Health Organization, 2002) and the co-morbidities associated with such lifestyle factors (Hardman & Stensel, 2003), understanding the motivational underpinnings of exercise behaviour is a priority. A conceptual framework often used to study motivation for health enhancing behaviours (e.g., smoking cessation, weight control, healthy diet, medication adherence and exercise) is self-determination theory (SDT; Deci & Ryan, 2000; Ryan & Deci, 2007; Ryan, Patrick, Deci, & Williams, 2008).

The goals that individuals pursue are of central importance when studying motivation using SDT. Goals are defined by Austin and Vancouver (1996) as “internal representations of desired states, where states are broadly construed as outcomes, events or processes” (p.338) and from the SDT perspective both the *content* and the *behavioural regulation* of goal directed behaviour are important considerations. Goal content refers to the “what” of motivation, or a person’s specific aspiration (e.g., to be healthy) whereas behavioural regulation refers to the “why” of motivation or a person’s reasoning behind their chosen goal (e.g., because a health practitioner has told them to start exercising) (Deci & Ryan, 2000). The purpose of the present study was to investigate the prediction of objectively assessed exercise behaviour from the “what” and the “why” of exercise goals as forwarded in SDT.

6.2.1 Goal Content and Behavioural Regulation

Self-determination theory is based on organismic (i.e., humans are hypothesised to be growth oriented) and dialectic (i.e., growth occurs via environmental interactions) foundations from which the motivational properties and outcomes of goal pursuits are studied (Deci & Ryan, 2000). A central tenet of the organismic-dialectic perspective is the proposal of three psychological needs, for autonomy, competence and relatedness which underlie optimal human growth, functioning and adaptive environmental interactions. Autonomy refers to the need to feel like the origin of one’s behaviour, competence refers to the need to interact effectively with- and master one’s environment and relatedness refers to the need to feel a sense of mutual connectedness in one’s social surroundings (Deci & Ryan, 2000). Deci and Ryan (2000) contend that where goal pursuit (through its content and

regulation) facilitates need satisfaction, adaptive cognitive, affective and behavioural outcomes will occur.

From the goal content perspective, goals are forwarded as being intrinsic (i.e., are satisfying of psychological needs) or extrinsic (i.e., are unsatisfying of psychological needs) (Deci & Ryan, 2000; Kasser & Ryan, 1993, 1996; Vansteenkiste, Lens, & Deci, 2006). Studies of individual differences in general life goal (or aspiration) content have found that placing importance on intrinsic (e.g., community contribution, physical fitness or social affiliation) versus extrinsic (e.g., wealth, fame or appearance) goals has adaptive correlates such as psychological well-being, less depression and anxiety and reduced physical symptoms (see Kasser, 2002; Kasser, Cohn, Kanner, & Ryan, 2007 and; Vansteenkiste, Soenens, & Duriez, 2008 for reviews). Conversely, extrinsic, relative to intrinsic, goal importance is negatively associated with well-being (Sheldon, Ryan, Deci, & Kasser, 2004) and positively associated with maladaptive outcomes such as body image concerns (Thøgersen-Ntoumani, Ntoumanis, & Nikitaras, in press), antisocial attitudes (Duriez, Vansteenkiste, Soenens, & De Witte, 2007; McHoskey, 1999), and behaviours (Sheldon & Kasser, 1995; Sheldon & McGregor, 2000).

The goal content perspective has recently been extended to the exercise domain through the development of a theoretically aligned tool with which to assess intrinsic and extrinsic exercise goals (Sebire, Standage, & Vansteenkiste, 2008, Chapter 3). In this work, exercise goals for health management, skill development and social affiliation were classified as intrinsic whereas exercise goals for image and social recognition were classified as extrinsic. This advancement has facilitated investigation of the cognitive, affective and behavioural effects of placing importance on divergent exercise goals. In line with SDT-based hypotheses, Sebire, Standage, and Vansteenkiste (2009, Chapter 4) identified that average intrinsic relative to extrinsic goal importance was positively associated with psychological need satisfaction in exercise, physical self-worth, psychological well-being, and self-reported exercise behaviour and negatively associated with exercise-based anxiety.

Similar effects of intrinsic versus extrinsic goal pursuit have been identified in studies where the pursuit of goals for learning activities (e.g., learning about recycling or learning the techniques of an activity such as tae-bo) were experimentally manipulated (see Vansteenkiste, Soenens, & Lens, 2007 for a review). In a series of studies, Vansteenkiste and colleagues manipulated goal content by asking participants

(ranging from adolescents to young adults) to read a paragraph of text which framed a learning activity in terms of intrinsic (e.g., “performing exercise has been frequently reported to enhance physical health”) and extrinsic (e.g., “by taking part in exercise, individuals can maintain youthful looks and appear attractive to others”) goals. In these studies it was shown that participants who received the intrinsic versus extrinsic goal framing manipulation approached learning tasks with greater autonomous motivation and more adaptive learning strategies, performed better on tests related to the material or techniques they learnt and persisted longer in free-choice behaviours linked to the learning activity. The present study aimed to build upon the programme of work developed by Sebire et al. (2008; 2009, Chapters 3 and 4) by focussing on the prediction of behavioural outcomes and exploring in more detail the motivational dynamics between goal content and behavioural regulation.

With regards to behavioural regulation, in SDT, motivation is classified as autonomous or controlled based on the degree to which a goal is pursued with a sense of self-determination (Deci & Ryan, 2000). Autonomous motivation comprises *intrinsic motivation* and *identified regulation*. Intrinsic motivation stems from the inherent satisfaction, enjoyment or challenge of participation and in an activity whereas identified regulation derives from a sense of value and personal endorsement of an activity. Controlled motivation reflects less self-determined reasons for goal pursuit and is underpinned by *introjected regulation* in which motivation stems from self-imposed sanctions such as guilt, shame or pride and *external regulation* where behaviours are enacted to comply with external demands or to obtain externally based rewards. When an individual’s actions are underpinned by autonomous versus controlled motivation it is hypothesised that they will experience adaptive psychological functioning and greater behavioural performance and persistence (Deci & Ryan, 2000).

These contentions have found support in studies of motivation in the exercise domain, research conducted in adult samples has largely identified positive associations between autonomous motivation towards exercise and self-reported (Edmunds, Ntoumanis, & Duda, 2006; Wilson, Rodgers, Blanchard, & Gessell, 2003; Wilson, Rodgers, Fraser, & Murray, 2004) and objectively assessed (Standage, Sebire, & Loney, 2008) moderate-to-vigorous exercise behaviour.

Despite representing theoretically differentiated concepts, goal content and behavioural regulation tend to covary as they share associations with psychological

need satisfaction (Deci & Ryan, 2000; see Sebire, Standage, & Vansteenkiste, 2008; Sebire et al., 2009, Chapters 3 and 4). Evidence from previous studies in the exercise domain supports this assertion, identifying an average bivariate correlation between the two concepts of $r = .44$ (Sebire, Standage, & Vansteenkiste, 2008; Sebire et al., 2009). Given their theoretical and statistical independence (i.e., although correlated, the average correlation between goal content and behavioural regulation is not indicative of redundancy) it is hypothesised that scores on these variables predict independent variance in outcomes such as well-being (Deci & Ryan, 2000; Sheldon et al., 2004). This hypothesis has been challenged by some researchers (e.g., Carver & Baird, 1998) who contend that the observed associations between relative intrinsic goal content and well-being are due to autonomous and controlled behavioural regulations which accompany intrinsic and extrinsic goals respectively. However, studies of general life-level (Sheldon et al., 2004) and exercise-based (Sebire et al., 2009) goal content and behavioural regulation have shown that two constructs display independent effects on cognitive and affective outcomes such as psychological well-being, physical self-worth and exercise-based anxiety.

6.2.2 Goal Content, Behavioural Regulation and the Prediction of Exercise Behaviour

Despite the hypothesis forwarded within SDT and evidence pertaining to the independent effects of goal content and behavioural regulation on cognitive and affective outcomes (Sebire et al., in press; Sheldon et al., 2004), similar findings have not been consistently observed when testing behavioural indices. In line with previous empirical investigations (Gillison et al., 2006; Ingledew & Markland, 2008) in this paper we suggest that intrinsic and extrinsic goal content precedes the behavioural regulation of that goal. It appears logical to assume that one must have a goal in mind before one can become autonomous or controlled in their regulation of it. It is conceivable that controlled motivation in other domains may be unsatisfying of basic psychological needs and prompt the compensatory pursuit of goals with extrinsic content. However our preference here is for goal content to precede behavioural regulation as this facilitates the testing of mediation of the effect of goal content on outcomes by behavioural regulation in line with the hypotheses of SDT (Deci & Ryan, 2000).

Specifically, in the experimental studies conducted by Vansteenkiste et al. (2004), in addition to goal content, behavioural regulation was also manipulated in the

goal-framing texts enabling the effects of both to be tested on the behavioural outcomes. Although test performance was independently predicted by the intrinsic goal content and autonomous motivation manipulations, the effect of the intrinsic goal content manipulation on behavioural persistence was mediated by autonomous motivation.

In contrast, in a cross-sectional study of adolescent British school children Gillison, Standage, and Skevington (2006) found individual differences in goal content towards exercise to have direct effects on self-reported leisure-time exercise, as well as indirect effects via exercise behavioural regulation. Finally, evidence from studies conducted by Ingledew and Markland (2008) and Sebire et al. (2009) in large samples of British adults similarly found that goal content no longer yielded an independent association with self-reported exercise behaviour once behavioural regulations were taken into account, suggesting that the goal-content effects were carried by the behavioural regulations underlying them. In light of these findings, Sebire et al. (2009) suggested that it could be the case that, one's behavioural regulation may be more proximal to behavioural engagement than one's intrinsic or extrinsic goal content towards exercise.

Together, the findings of Vansteenkiste et al. (2004), Gillison et al. (2006), Ingledew and Markland (2008) and Sebire et al. (2009) paint an unclear picture of whether the effect of exercise goal content on markers of exercise behaviour occur above and beyond or via exercise behavioural regulation. However, apart from the evidence from Vansteenkiste et al.'s (2004) study, evidence of the independent effects of goal content and behavioural regulation on exercise behaviour is derived from studies that used cross-sectional study design. Further, only two of these studies (i.e., Ingledew & Markland, 2008; Sebire et al., 2009) have been conducted among adult populations. In addition, although the predictive effects of autonomous and controlled behavioural regulation on exercise engagement have been assessed using objectively measured behaviour (Standage et al., 2008), studies of the predictive effect of goal content on exercise behaviour have previously relied on subjective behavioural self-reports. As such, further studies in adult populations using more robust behavioural assessments are warranted.

Self-report assessments of exercise behaviour are cost- and time-effective but are also vulnerable to error due to factors such as social desirability and recall biases (Dale, Welk, & Matthews, 2002). In addition, behavioural indices derived from many

self-report exercise questionnaires are generalised and provide little information about the nature of behavioural engagement beyond recalled frequency and perceived intensity. Therefore it is difficult or impossible to accurately measure exercise duration, bout length and the meeting of public health recommendations from self-report data. However, knowing whether theoretically derived constructs such as goal content and behavioural regulation predict meaningful behavioural engagement, such as the meeting of public health recommendations, is important for psychologists and health practitioners alike.

6.2.3 The Present Research

The purpose of the present study was to examine the prediction of exercise behaviour by the content and behavioural regulation of exercise goals in an adult sample. Extending previous work, a prospective study was conducted and objective behavioural assessment employed to quantify meaningful behavioural engagement.

6.3 Method

6.3.1 Participants

Participants were volunteers from the South West of England (62.4% university employees, 20.8% members of the public, 16.8% postgraduate students). Participants were eligible for inclusion if they: (a) were aged 18 to 65 years, (b) reported performing at least one exercise session per week on average (to ensure the relevance of questions pertaining to exercise motivation), (c) were not a solely water-based exerciser (e.g., a swimmer) and (d) were free from chronic diseases/physical disabilities.

The study protocol was completed by 107 participants (Ethnicity; White = 99%, Asian = 1%). Owing to device malfunction, behavioural data was incomplete (i.e., <5 valid days of data) for six participants. The final sample comprised 101 individuals (33 males, 68 females; M age = 38.79 years; SD = 11.50; range = 21.39 to 63.39 years). The average Body Mass Index (BMI) of the sample (M = 24.33 kg/m²; SD = 3.52; range = 19.17 to 37.89 kg/m²) resided near the upper threshold of the “normal” range (American College of Sports Medicine, 2006) and average waist circumference (WC) values (Males: M = 85.76 cm; SD = 10.80, Females: M = 76.03 cm; SD = 8.56) were also within gender specific “low risk” ranges (American College of Sports Medicine, 2006).

6.3.2 Procedure

Following institutional ethical approval, volunteer participants were recruited by an advertisement on a university Web-page and posters located around a university campus. The protocol of the study followed a prospective three time-point design, which lasted 16 days. At Time 1, participants were given information about the study and provided informed consent. Demographics, exercise goal content and behavioural regulation were assessed on this occasion. Seven days later (Time 2) participants returned to the laboratory and anthropomorphic measurements (height, weight and WC) were taken. Participants were asked to wear an ActiGraph accelerometer (ActiGraph, LLC, Pensacola, FL) for the following seven days and to complete a daily physical activity log. Eight days after Time 2, participants returned to the laboratory (Time 3) and returned the accelerometer and activity log. Participants were debriefed as to the purpose of the study and were given the opportunity to ask questions.

6.3.3 Measures

Exercise goal content. The Goal Content for Exercise Questionnaire (GCEQ; Sebire, Standage, & Vansteenkiste, 2008) was used to assess the importance participants placed on intrinsic exercise goals for health management, skill development and social affiliation and extrinsic goals for image and social recognition. The GCEQ consists of 20-items (four per goal subscale) which are rated on a 7-point Likert scale ranging from 1 (*not at all important*) to 7 (*extremely important*). Participants respond to the stem “please indicate to what extent these goals are important for you.” Previous research has identified that scores derived from the GCEQ display good internal consistency, factorial, internal and external validity, temporal stability and gender invariance (Sebire, Standage, & Vansteenkiste, 2008; Sebire et al., 2009). In the present study, internal consistency of the five subscales was as follows; health management ($\alpha = .82$), skill development ($\alpha = .89$), social affiliation ($\alpha = .84$), image ($\alpha = .89$) and social recognition ($\alpha = .89$). In line with the SDT literature (Deci & Ryan, 2000) and previous work (Sebire et al., 2009; Sheldon et al., 2004) a relative intrinsic goal variable was calculated by subtracting the average of scores on extrinsic goal items ($\alpha = .87$) from the average of scores on intrinsic goal items ($\alpha = .85$).

Exercise behavioural regulation. Participants completed Mullan, Markland and Ingledew’s (1997) 15-item Behavioural Regulations in Exercise Questionnaire (BREQ). The BREQ assesses intrinsic motivation and identified, introjected and

external exercise-based behavioural regulations. Participants respond to the stem “why do you exercise?” and rate each item on a 5-point Likert scale ranging from 0 (*not true for me*) to 4 (*very true for me*). In the current study the internal consistency of the four BREQ subscales was as follows; intrinsic motivation ($\alpha = .92$), identified regulation ($\alpha = .82$), introjected regulation ($\alpha = .82$) and external regulation ($\alpha = .77$). Bivariate correlations between the regulatory subscales conformed to a simplex pattern (Guttman, 1954). As such, and aligned with past work (Koestner, Otis, Powers, Pelletier, & Gagnon, 2008; Ntoumanis & Standage, in press) scores on intrinsic motivation and identified regulation were averaged to form an autonomous motivation variable ($\alpha = .88$) and introjected regulation and external regulation scores were averaged to form a controlled motivation variable ($\alpha = .66$).

Exercise Behaviour. Participants wore an ActiGraph GT1M accelerometer (ActiGraph, LLC, Pensacola, FL). The GT1M is a small (3.8 x 3.7 x 1.8 cm) uniaxial accelerometer which detects time varying acceleration (approximate range = 0.05 to 2.0g) in the vertical plane 30 times per second. These measurements are then summed over a user-defined epoch (e.g., 60s) (see Chen & Bassett, 2005 for a technical overview).

The accelerometer was secured to a nylon belt which was worn tightly around the waist with the accelerometer positioned on the mid-axillary line of the right hip (Trost, McIver, & Pate, 2005). As recommended by Trost et al. (2005) participants were instructed verbally and via a standardised written instructions to start wearing the accelerometer on waking each day, wear it throughout the day and remove it on going to bed at night. Participants also removed the accelerometer during participation in water sports, showering and bathing. To address potential reactivity to wearing the accelerometer, participants were instructed that it was measuring the time of day they moved and care was taken not to divulge its true purpose (i.e., to measure level of activity). In addition, participants wore the accelerometer for the remainder of the day of their Time 2 appointment; however, data collection was programmed to start from 00:01 the following morning. Accelerometer data was collected in 60-second epochs for seven consecutive days.

During the behaviour monitoring protocol, participants completed a log of the major activities (both active and inactive) performed each day. Participants were instructed to record a description, the duration and perceived intensity (i.e., light, moderate or vigorous) of the activities performed. Participants also recorded times and

details of activities performed when they did not wear the monitor during waking hours (e.g., for showering or swimming).

6.3.4 Data Analysis

Accelerometer data. Accelerometer data were downloaded to a PC via a USB interface and imported to a Microsoft Access database for analysis with an in-house macro. The number of “valid days” of data for each participant was analysed using the 70/80 rule (Catellier et al., 2005) and activity log data.¹ Participants with ≥ 5 valid days of accelerometer data were included in the final sample. Accelerometer data were screened to quantify participation in moderate-to-vigorous physical activity (MVPA). The counts.min⁻¹ threshold for moderate intensity activity (i.e., ≥ 3 metabolic equivalents²) as defined by Freedson, Melanson, and Sirard (1998) (i.e., ≥ 1952 counts.min⁻¹) was used.³ In line with public health physical activity recommendations (Haskell et al., 2007) behavioural variables were quantified to reflect: (a) average minutes of MVPA per day, (b) average minutes of MVPA in bouts ≥ 10 minutes per day and (c) number of days during monitoring on which ≥ 30 minutes of MVPA was accumulated in bouts of ≥ 10 minutes.

To account for activities which are not accurately recorded by the accelerometer (e.g., swimming, cycling, rowing and weight-lifting) data (i.e., mode, duration and intensity) from the activity log, combined with visual inspection of graphical accelerometer data, was used to adjust the variable reflecting average minutes per day spent in MVPA. Combining objective and subjective measures in this way is recommended by Pettee, Storti, Ainsworth, and Kriska (2009) has been employed previously (e.g., Sherar, Esliger, Baxter-Jones, & Tremblay, 2007).

Statistical analyses. Mean replacement was used to replace missing values ($n = 2$) and standardised skewness and kurtosis values were analysed to determine normality. The variables representing autonomous motivation, average daily time spent in MVPA, adjusted average daily time spent in MVPA, and total time spent in MVPA in bouts ≥ 10 minutes displayed non-normality. In line with the recommendations of Tabachnick and Fidell (2007) these variables were transformed according to the nature of their individual distributions. A reflect and square root transformation was applied to the autonomous motivation scores. For interpretation purposes this variable was re-reflected following analysis (Tabachnick & Fidell, 2007). A square-root transformation was applied to each of the behavioural variables. Finally, analysis of residuals for assumptions pertaining to regression analyses (i.e.,

linearity, homoscedasticity and independence and normality of residuals) revealed no particular problems.

6.4 Results

Seven valid days of accelerometer data were collected for the majority of participants ($n = 82$), with 15 participants providing six valid days and four participants providing five valid days of data. On average, a valid day consisted of 834 minutes (13.90 hours) of data. As recommended by Trost et al. (2005), to check whether inter-instrument variability accounted for variance in the accelerometer-derived scores we correlated the serial number of the ActiGraph worn by each participant with each of their behavioural indices. All correlations were very small and non-significant, therefore ActiGraph unit was not specified as a covariate in further analyses.

6.4.1 Preliminary results

Table 6.1 presents the bivariate correlations between the study variables. On average, the participants rated intrinsic exercise goals as more important than extrinsic exercise goals and endorsed autonomous behavioural regulation more strongly than controlled behavioural regulation. According to the unadjusted MVPA variable, participants completed an average of approximately 60 minutes of MVPA per day. Adjustment of this value with data from the activity logs increased average daily MVPA participation to approximately 68 minutes. A t -test indicated that the average minutes of unadjusted MVPA ($M = 58.85$, $SD = 25.80$) was significantly smaller than the average minutes of activity-log-adjusted MVPA ($M = 68.07$, $SD = 30.81$) $t(100) = -6.86$, $p = .00$, (Hedges $g = -.32$). As such, both variables were included in further analyses. When accelerometer data was screened for bouts of MVPA ≥ 10 minutes, on average, participants completed approximately 25 minutes. On average, participants achieved the guidelines of a daily accumulation of 30 minutes of MVPA accumulated in bouts of ≥ 10 minutes on only 2.56 days during assessment (range = 0 to 7 days).

Table 6.1

Descriptive Statistics and Bivariate Correlations among Study Variables

Variable	<i>M</i>	<i>SD</i>	Range	1	2	3	4	5	6	7	8	9	10
1. Age	38.79	11.50	23.39 to 63.39	-									
2. Gender	-	-	-	-.09	-								
3. BMI/WC criteria	-	-	-	.19*	.12	-							
4. Relative intrinsic goals	.65	1.28	-3.17 to 4.33	.07	-.08	-.04	-						
5. Autonomous motivation	3.31	.65	1.50 to 4.00	.01	-.08	-.18	.32**	-					
6. Controlled motivation	1.02	.60	.00 to 2.67	-.17	.03	.07	-.44**	.03	-				
7. Average daily time in MVPA (min)	58.85	25.80	15.43 to 143.14	.10	-.21*	.06	-.09	.25*	-.12	-			
8. Adjusted daily time in MVPA (min)	68.07	30.81	16.67 to 160.67	.20*	-.31**	.05	-.07	.21*	-.15	.91**	-		
9. Average daily time in MVPA in bouts >10 min (min)	25.43	22.24	.00 to 116.43	.08	-.13	-.22*	-.09	.26*	-.07	.82**	.75**	-	
10. Number of days meeting ACSM/AHA guidelines	2.56	2.05	.00 to 7.00	-.07	.05	-.22*	-.10	.28*	-.07	.74**	.65**	.90**	-

Note. MVPA = moderate-to-vigorous physical activity. BMI/WC = body mass index/waist circumference. ACSM/AHA = American College of Sports Medicine/American Heart Association. * $p < .05$, ** $p < .01$.

Bivariate correlations revealed that participant age was positively correlated with adjusted daily MVPA participation. Participant gender (dummy coded; female = 0, male = 1) displayed negative correlations with unadjusted and adjusted daily MVPA participation such that females participated in less MVPA than males. Risk stratification based on BMI/WC (Zhu et al., 2004) measures correlated negatively with MVPA accumulated in bouts ≥ 10 minutes and number of days on which participants met the ACSM/AHA physical activity recommendations. Owing to these relationships, participant age, gender and BMI/WC risk stratification were entered as covariates in further analyses.

With regards to the motivational variables, relative intrinsic goal content was correlated in the expected directions with autonomous and controlled behavioural regulations and was uncorrelated with the behavioural variables. Autonomous behavioural regulation displayed positive correlations- whereas controlled regulation was uncorrelated with all behavioural variables.

6.4.2 Mediation analysis

The hypothesised model (Figure 6.1) represented a single-step multiple mediation model (Preacher & Hayes, 2008b).

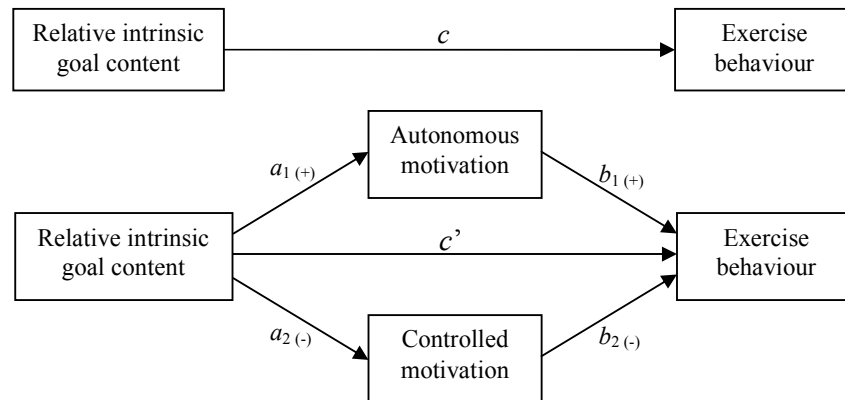


Figure 6.1 Hypothesised multiple mediation model. (Symbols in parentheses indicate the hypothesised direction of effects).

Hierarchical linear regression was used to establish the value of the c , a_1 , a_2 , b_1 , b_2 and c' paths while controlling for participant gender, age and BMI/WC. When calculating the values of the b_1 and b_2 paths the effect of the other mediator on the dependent variable was controlled (Preacher & Hayes, 2008a).

Models A to D in Figure 6.2 display the results of the regression analyses. In all models there was no direct relationship between relative intrinsic goal content and the behavioural variables. Relative intrinsic goal content was positively associated with autonomous behavioural regulation and negatively associated with controlled motivation. Autonomous behavioural regulation displayed positive associations with each of the exercise behaviour dependent variables indicating its possible mediating role, whereas controlled behavioural regulation was unrelated to the behavioural variables suggesting that it could not be a mediator.

Although a significant “*c*” path, that is, the direct association between goal content and exercise behaviour was not identified in the data, it is recommended in recent literature that this is not a requirement of mediation (MacKinnon, 2007; Shrout and Bolger, 2002). Shrout and Bolger (2002) suggest that failing to find a significant direct association between an independent and dependent variable may be due to these variables being too distal from one another to be meaningfully related. Given their distal relationship it is likely that the effects of the independent (e.g., goal content) on the dependent variable (e.g., exercise behaviour) is transmitted through a mediator which is located more proximally to both the independent and dependent variables (e.g., behavioural regulation) and bridges the gap between them. In this situation, it is recommended that mediation analysis continue without an initial direct effect. Therefore, mediation of the effect of relative intrinsic goal content on exercise behaviour via behavioural regulations was tested using the macro developed by Preacher and Hayes (2008a). This macro facilitates the non-parametric testing of multiple mediator models while controlling for possible covariates. Indirect effects of relative intrinsic goal content on exercise behaviour (i.e., the product of a_1b_1 and a_2b_2 as in Figure 6.1) were analysed to establish mediation. As the product of ab displays a normal distribution only in large samples it is recommended that bootstrapping (Efron & Tibshirani, 1993; see MacKinnon, 2007 for an overview specific to mediation analysis) is used to construct confidence intervals around a point estimate of the indirect effect (MacKinnon, Lockwood, & Williams, 2004; Preacher & Hayes, 2008a). Commensurate with these recommendations the bootstrap procedure was used to construct bias-corrected and accelerated 95% confidence intervals (BCa 95% CI) of the indirect effect. 5000 bootstrapped samples with replacement and of the same size as the original sample were requested (Preacher & Hayes, 2008a).

Table 6.2 presents the total and specific indirect effects transmitted through autonomous and controlled behavioural regulations and their BCa 95% CIs. In each model, the total indirect effects were non-significant suggesting that the two proposed mediators did not transmit the effect of goal content to exercise behaviour. However, it is possible for the specific indirect effects to be significant, when the total indirect effect is non-significant, indicating mediation (Preacher & Hayes, 2008b; Shrout & Bolger, 2002). This was true of the present data as significant specific indirect effects indicated that (controlling for controlled behavioural regulation) autonomous behavioural regulation mediated the effect of relative intrinsic goal content on each behavioural dependent variable (i.e., the BCa 95% CI of the indirect effect did not include zero). Pairwise contrasts of the specific indirect effects indicated that the mediated effect via autonomous behavioural regulation differed significantly from the mediated effect via controlled behavioural regulation.

The findings of a non-significant total indirect effect despite a significant indirect effect being observed via autonomous motivation may be indicative of inconsistent mediation (MacKinnon, Fairchild, & Fritz, 2007) and suppression (Preacher & Hayes, 2008b). Multiple mediation models are described as inconsistent where indirect effects have opposing signs. In the present data, the positive specific indirect effect through autonomous motivation may have been cancelled out by the negative (albeit non-significant) specific indirect effect through controlled motivation. In this case autonomous motivation acted as a mediator whereas controlled motivation acted as a suppressor (Preacher & Hayes, 2008b).⁴

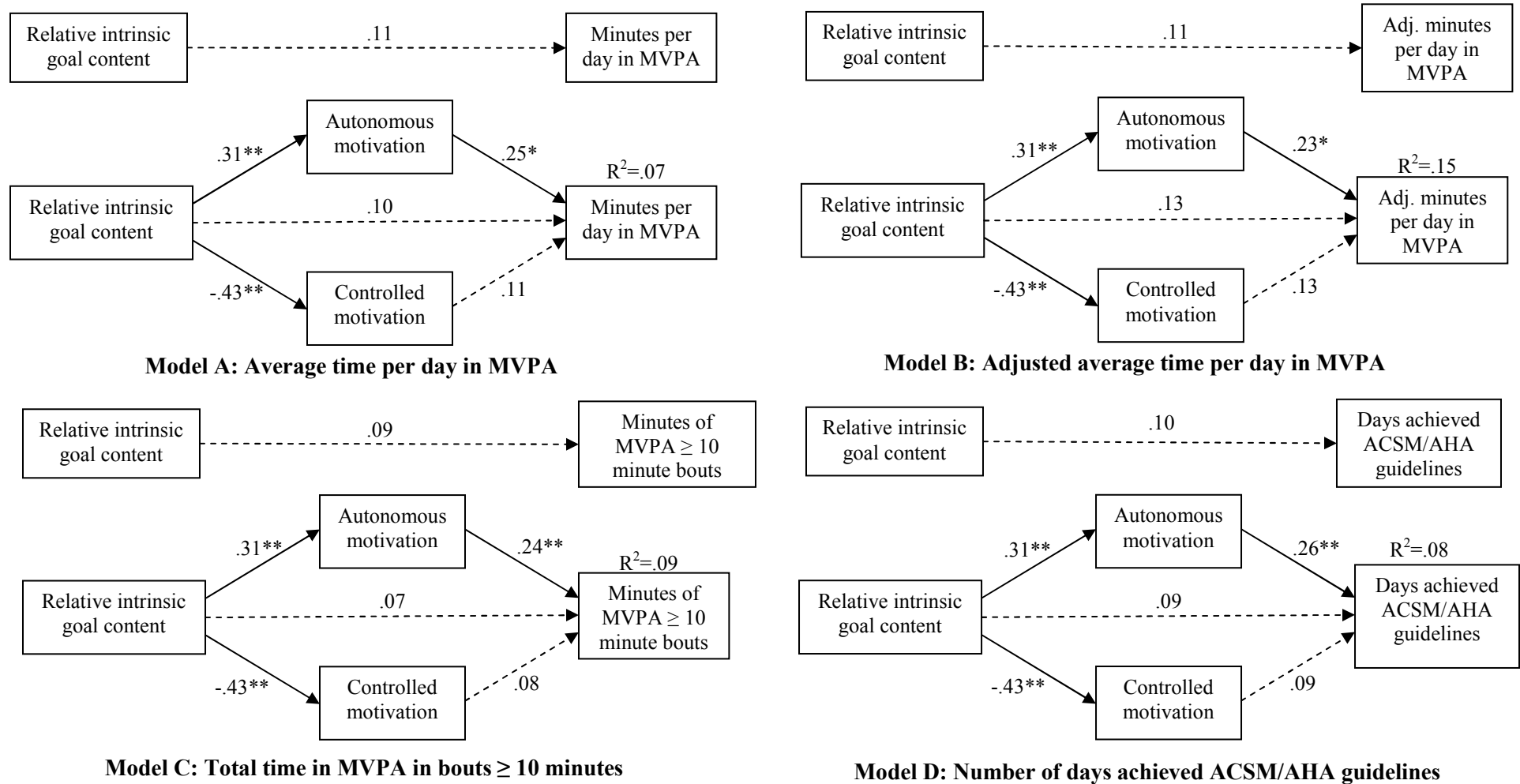


Figure 6.2 Multiple mediation models showing effects of goal content on indices of exercise behaviour via autonomous and controlled behavioural regulation after controlling for age, gender and BMI/WC.

Note. Values are standardised estimates. *b* paths (as in figure 6.1) are estimated controlling for the other mediator. Dashed lines represent non-significant estimates. * $p < .05$, ** $p < .01$. ACSM/AHA guidelines are for 30 minutes of MVPA accumulated in bouts of ≥ 10 minutes.

Table 6.2

Unstandardised Indirect Effects of Relative Intrinsic Goal Content on Exercise Behaviour through Autonomous and Controlled Motivation

	Point estimate	BCa 95% confidence interval	
		Lower	Upper
Model A: Average minutes per day in MVPA			
Total indirect effect	.036	-.216	.258
Autonomous motivation (a_1b_1)	.119	.030	.252
Controlled motivation (a_2b_2)	-.083	-.295	.061
Contrast (a_1b_1) vs. (a_2b_2)	.202	.052	.397
Model B: Adjusted average minutes per day in MVPA			
Total indirect effect	-.027	-.206	.146
Autonomous motivation (a_1b_1)	.086	.012	.188
Controlled motivation (a_2b_2)	-.113	-.274	.001
Contrast (a_1b_1) vs. (a_2b_2)	.199	.076	.373
Model C: Average minutes in MVPA in bouts ≥ 10 minutes			
Total indirect effect	.009	-.174	.171
Autonomous motivation (a_1b_1)	.095	.018	.213
Controlled motivation (a_2b_2)	-.087	-.244	.030
Contrast (a_1b_1) vs. (a_2b_2)	.181	.043	.351
Model D: Number of days where ACSM/AHA guidelines were achieved			
Total indirect effect	.033	-.217	.244
Autonomous motivation (a_1b_1)	.116	.024	.250
Controlled motivation (a_2b_2)	-.083	-.288	.046
Contrast (a_1b_1) vs. (a_2b_2)	.199	.063	.390

Note. BCa = Bias corrected and accelerated. MVPA = moderate-to-vigorous physical activity. ACSM/AHA guidelines are for 30 minutes of MVPA accumulated in bouts of ≥ 10 minutes.

6.5 Discussion

The purpose of the present study was to advance the existing literature pertaining to the prediction of exercise behaviour in adults from the content and regulation of their exercise goals. This was achieved through the use of a theoretically aligned measure of goal content (i.e., the GCEQ) combined with objective measurement of behavioural engagement (i.e., ActiGraph accelerometry) and a prospective study design.

Our preliminary analysis did not reveal a bivariate correlation between relative intrinsic goal content and objectively assessed engagement in moderate-to-vigorous exercise behaviour. This finding stands in contrast to those of Ingledew and Markland (2008) and Sebire et al. (2009) who identified small but significant associations between (a) health and fitness goals and self-reported exercise behaviour and (b) relative intrinsic goals and self-reported exercise, respectively. In support of the findings of past work using subjective (e.g., Edmunds et al., 2006; Wilson et al., 2004), and objective (e.g., Standage et al., 2008) behavioural measures, we observed a positive relationship between autonomous behavioural regulation and exercise behaviour. Additionally, the relationship between controlled behavioural regulation and exercise behaviour was consistently non-significant across the entire behavioural criterion. These findings provide support for the adaptive behavioural effects of being self-determined in one's motivation for exercise.

6.5.1 Independence of “What” and “Why” on Exercise Behaviour

Within SDT, it is hypothesised that goal content and behavioural regulation are associated but yield independent effects (Deci & Ryan, 2000; Sheldon et al., 2004). In the present study goal content and behavioural regulation were moderately correlated. We tested the independent effects of goal content and behavioural regulation on the exercise behaviour variables using mediation analysis. The results showed that after controlling for the potential confounding effects of the participants' age, gender and BMI/WC, goal content had a positive indirect effect on the objective markers of exercise behaviour through autonomous behavioural regulation. We observed no direct independent effect of goal content on behaviour. These findings support observations made previously (e.g., Ingledew & Markland, 2008; Sebire et al., 2009) of a motivational sequence, in which intrinsic goal content positively predicts autonomous behavioural regulation that then positively predicts exercise behaviour.

This sequential model was not supported when we previously tested the simultaneous effects of goal content and behavioural regulation on cognitive and affective outcomes in exercise such as exercise anxiety and exercise-based psychological need satisfaction and general physical self-worth and well-being (Sebire et al., 2009, Chapter 4). In this investigation, exercise behavioural regulation only partially accounted for the relationships between exercise goal content and these cognitive-affective variables. As such, the effect of goal content on this qualitative component was manifested through direct effects as well as through autonomous motivation. We identified the latter path only in the prediction of behaviour in the present study.

The contention in SDT that goal content and behavioural regulation will yield independent effects (Deci & Ryan, 2000; Sheldon et al., 2004) was not supported in our analysis of behavioural outcome variables. Collectively, and in line with the contentions of Vansteenkiste et al. (2008), the evidence from the studies of Ingledew and Markland (2008), Sebire et al. (2009) and the present work appear to suggest that goal content and behavioural regulation have independent effects on some variables and not others. In addition, it is clear from the findings of these studies that the effects of relative intrinsic goal content for exercise on cognitive, affective and behavioural outcomes are carried through multiple pathways. First, in addition to direct effects, effects on cognitive and affective outcomes are manifested through psychological need satisfaction and through one's behavioural regulation. Second, the effects of goal content on behavioural outcomes appear to be carried through behavioural regulation. These direct and indirect effects on cognitive-affective components and indirect effects on behaviour highlight the utility of considering the content of exercisers' goals. We have previously suggested that the effects observed may point to the possibility that a person's goals for exercise may be more distal from their decision to exercise than their momentary behavioural regulation (Sebire et al., 2009, Chapter 4).

6.5.2 Goal Content: Quality not Quantity?

Although direct effects of exercise goal content on behavioural engagement were not observed, in line with the contentions of SDT, findings reported by Sebire et al. (2009) provide evidence for the effect of exercisers goal content on the qualitative component of exercise over and above their behavioural regulation. Further, taking a different methodological approach, Sebire, Standage, Gillison and Vansteenkiste (2008, Chapter 5) recently explored the qualitative experiences of those pursuing

relative intrinsic and relative extrinsic exercise goals. Their analysis revealed a number of contrasting experiences of similar processes such as social comparison and goal attainment between the two groups. The experiences of the relative intrinsic goal exercisers displayed a flexible, positive, confident and long-term perspective on exercise whereas the experiences of the relative extrinsic goal exercisers were characterised by stressful interpersonal comparisons, rigid engagement, a lack of confidence in goal attainment and a short-term quick fix approach to exercise. Combined with the present findings, such work highlights the importance of goal content in considering exercisers' cognitive-affective experiences in addition to their quantity of behavioural engagement as such factors provide more insight in the quality of exercise engagement.

6.5.3 The Role of Goal Content in Practice

Understanding the pathways through which a person's goals for an activity may influence their behaviour or cognitive-affective experiences is important because the pathways and variables identified may represent possible avenues for intervention in those who are in need of changing their behaviour. For example, from the evidence gleaned from our analysis, the content of an exerciser's goals may give a practitioner insight into their likely behavioural regulation which will predict their behaviour. However, and while past work supports moderate relations between conceptually aligned constructs (Sebire, Standage, & Vansteenkiste, 2008; Sebire et al., 2009), practitioners should remember as pointed out in the Introduction and by Vansteenkiste et al. (Vansteenkiste et al., 2008) that it is theoretically possible to pursue intrinsic goals with controlled behavioural regulations and extrinsic goals with autonomous behavioural regulation. Further, a common objective of SDT-based interventions is to augment the internalisation of controlled behavioural regulations to more personally valued, self-emanating and autonomous regulations (cf. Sheldon, Williams, & Joiner, 2003). The present findings suggest that the content of an exerciser's goals might be an important consideration if practitioners are to optimise internalisation.

6.5.4 Limitations and Future Directions

The present findings should be extended to more ethnically and educationally diverse samples as the majority of the participants in this study were White and well-educated. In addition, although at least five days of accelerometer data were collected from 101 participants in the present study, the results of this work should be repeated using larger samples. This said, although large samples would be advantageous, in

using objective behavioural assessment tools researchers are offered greater precision in their measurement. This may go some way to overcome concerns related to having sufficient power to detect relationships in moderate sized samples such as ours.

In using a prospective design, the present study advanced the cross-sectional methodology employed previously in the combined study of goal content and behavioural regulation in exercise. However, a limitation is that exercise behaviour was assessed over a single seven-day period only, rather than on multiple occasions and therefore the analysis is cross-sectional. Previous SDT-based research suggests that longitudinal studies of motivation and behaviour in the physical domain may produce some interesting results. For example, while adaptive short-term effects of introjected regulation on self-reported exercise engagement have been observed (e.g., Edmunds et al., 2006; Wilson et al., 2004), a similar short-term effect observed in the sport domain, using attendance of training sessions as a behavioural marker, did not persist in the long-term (Pelletier, Fortier, Vallerand, & Briere, 2001). Given the associations between goal content and behavioural regulation identified in the present study, future longitudinal research using objective assessment of exercise behaviour would do well to explore the dynamics of both of these motivational constructs on behavioural engagement over time. Future longitudinal studies would also do well to incorporate measurement and analysis of the cognitive-affective quality of people's exercise behaviour in addition to its quantity. It would be interesting to extend the findings of Sebire et al. (2009) and the findings of Chapter 5 to determine whether over time the quality (i.e., flexible vs. rigid engagement, anxiety, and social comparison processes) rather than the quantity of exercise engagement is predicted by one's exercise goals and regulations independently. Combining this with longitudinal behavioural assessments would help to further understand potential maladaptive effects of exercise quality on exercise quantity.

Additionally, in the present work only one part of the more complex theoretical model posited in SDT was considered. Although this study adds to a number of strands of evidence (e.g., Sebire et al., 2009, Vansteenkiste et al., 2004) that together begin to support the larger theoretical framework pertaining to goal content it is important that future work strives to simultaneously test the complete model. For example it would be insightful to examine theoretically proposed causal structures leading from social contextual factors such as autonomy support through psychological need satisfaction to relative intrinsic / extrinsic goal content and

behavioural regulation and subsequently to the consequences of such goal pursuits via a range of cognitive-attentional mediational mechanisms as proposed by Vansteenkiste et al. (2007) and in Chapter 5.

The objective assessment of exercise behaviour in the present study provided a number of advancements over the use of self-report questionnaires. However, the treatment of accelerometer data is based on a number of assumptions and is vulnerable to some limitations. For example, when considering bouts of MVPA of 10 minutes or longer, our software only allowed the extraction of bouts of ≥ 10 minutes with no interruptions. It is likely however that prolonged exercise is often intermittent (e.g., stopping to tie one's shoelace while jogging, or waiting to cross a busy road) and that ignoring these instances underestimates total MVPA performed in bouts. Future work could, aligned with the recommendations of Ward, Evenson, Vaughn, Rodgers, and Troiano (2005) employ software which can scan for activity bouts while allowing minor interruptions.

Uniaxial accelerometry is likely to be most accurate in measuring ambulatory activities such as walking and running (Cooper, 2003). As such, the intensity of participating in other activities such as weight-lifting or cycling will not be measured or underestimated. In the present study, we sought to address this limitation by triangulating the accelerometer data with concurrently collected activity log data; however, the use of more advanced technology may address this issue further. For example, Standage, Sebire and Loney (2008) have recently used the Actiheart device (Cambridge Neurotechnology Ltd) which bases the prediction of energy expenditure on concurrently assessed acceleration and heart rate data. Such methodologies therefore account for activities that may not induce high vertical acceleration but do induce a high heart rate (e.g., cycling, rowing, weight-lifting). Despite the intuitive appeal of such methods, when weighing up the use of accelerometry or combined accelerometry and heart rate devices, especially for use in longitudinal studies, researchers should consider issues such as the device cost, participant burden and the component of physical activity that they are seeking to measure.

6.6 Conclusion

In line with the sequential motivational model proposed by Ingledew and Markland (2008) and supported by Sebire et al. (2009), the present study identified relative intrinsic goal content to be positively associated with autonomous behavioural regulation which in turn positively predicted exercise behaviour. Advancing over previous studies, exercise behaviour was quantified by analysing at least five days of objective accelerometer data. Building on previous findings that relative intrinsic goal content predicts cognitive-affective outcomes in exercise (Sebire, Standage, Gillison et al., 2008; Sebire et al., 2009), the results of the present study suggest that the content of exercisers' goals is an important consideration when exploring optimal motivation for exercise behaviour.

6.7 Footnotes

¹ A day was defined as “valid” using a combination of the 70/80 rule (Catellier et al., 2005) and analysis of activity log data for individual participants. The 70/80 rule indicated that a valid weekday and weekend day should consist of 732 minutes and 664 minutes of recorded data respectively. Data was screened using a Microsoft Access macro which ignored periods in the data file where the accelerometer count was zero for ≥ 31 continuous minutes, which may be indicative of non-wear. There is no recommended threshold of continuous zeros for adult samples, although it is advised that the threshold should be greater than that used in studies of children (e.g., 20 minutes). Owing to the age and largely sedentary occupations of the participants in the present study, additional analyses were conducted to determine a feasible length of continuous zeros of accelerometer data ≥ 20 minutes that occur when participants reported wearing the accelerometer in the activity log. Daily minute-by-minute accelerometer data and activity log data from a random sample of 20 participants (5 males, 15 females, M age = 41.19, SD = 10.36; M BMI = 23.51, SD = 1.87) were analysed. The average length of a sequence of continuous zeros ≥ 20 minutes was 31.35 minutes. Each day of accelerometer data was classified as a “valid day” in a two step process. In Step 1 weekday and weekend day minutes/day thresholds (using the 70/80 rule while ignoring sequences of ≥ 31 zero counts) were analysed. Where a day was valid according to the 70/80 rule criteria (e.g., 732 minutes of data for a weekday) no further analysis was required. Where total minutes/day was less than the 70/80 rule criteria, in Step 2, activity log data and graphical accelerometer data were screened to identify whether the day was invalid due to non-wear, or valid but reflective of a largely sedentary day. Combining accelerometer and activity log data is forwarded as particularly useful for data reduction and analysis (Troost et al., 2005).

² 1 Metabolic equivalent (MET) is equal to resting energy expenditure (≈ 3.5 mL O₂ · kg⁻¹ · min⁻¹).

³ The software used to analyse the accelerometer data produced output in blocks of 200 counts (i.e., 0-199, 200-299). Time spent in MVPA was therefore extracted from the block closest to the threshold derived by Freedson et al. (1998) (i.e., ≥ 2000).

⁴ The mediation analyses were replicated using individual intrinsic and extrinsic goal content composite scores as independent variables (see Appendix 6.1

for results). Similar to the findings of the analysis using relative intrinsic goals, in each model, intrinsic goal content displayed specific positive indirect effect on the behavioural outcome via autonomous motivation. Regression analyses indicated that extrinsic goal content was unrelated to autonomous motivation (which was then significantly related to the behavioural outcomes) and positively related to controlled motivation (which was unrelated to the behavioural outcomes). As such, for extrinsic goals mediation was not possible and these analyses were not pursued further. This analysis suggests that the effects observed of relative intrinsic goal content on behaviour were carried by the intrinsic goal scores rather than the extrinsic goal scores.

6.8 References

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CHAPTER 7

General Discussion

General Discussion

7.1 Introduction

Statistics published in the 2006 Health Survey for England (The Information Centre, 2008) suggest that approximately 66% of adults in England do not achieve the guidelines of 30 minutes of moderate physical activity on five or more days of the week as recommended for health protection by the Government's Department of Health (DoH; 2004). In addition to making a marked contribution to achieving the DoH guidelines, incorporating regular physical exercise into the lifestyles of English adults would have positive consequences for the physical, mental and economic health of the nation (DoH; 2004). Such national priorities highlight the importance for understanding motivation for exercise in adults. To this end, the programme of research reported in the present thesis aimed to achieve a detailed analysis of exercise motivation through the study of adults' goals for exercise. Such analysis was focused on further understanding the impact of exercisers goals on the quality of their exercise experiences in addition to the quantity of their exercise behaviour. Specifically, four studies were conducted in line with the theoretical tenets of self-determination theory (SDT; Deci & Ryan, 2000). The theoretical hypotheses of SDT suggest that the content of individuals' goals (or "what" the individual aspires to) is an important consideration when examining issues of optimal psychological and behavioural functioning (Deci & Ryan, 2000; Kasser & Ryan, 1996; Vansteenkiste, Soenens, & Duriez, 2008). It was the aim of the four studies undertaken in the present work to examine the tenability of these hypotheses in the exercise domain.

This chapter summarises the findings of these four studies, which collectively showed that the concept of goal content as forwarded in SDT can be fruitfully applied to the study of motivation for exercise in adults. Specifically, attention is paid to how the findings correspond with theoretical proposals and research findings in the extant literature. In addition, the advances made through the investigations and the contribution of this body of work to the broader literature is presented. Finally, limitations of the studies, practical applications and avenues for future research are considered.

7.2 Summary of Findings and New Developments

7.2.1 *Measurement of Goal Content in the Exercise Context*

Study 1 (Chapter 3) documented the development and validation of the Goal Content for Exercise Questionnaire (GCEQ) which was designed to assess the importance placed on goals for exercise with intrinsic and extrinsic content in line with the SDT literature. Prior to this, a measure of general life goal content was available (i.e., the Aspirations Index, Kasser & Ryan, 1996) and the literature was abound with questionnaires to assess exercise *motives* or *reasons* that were not developed in line with the SDT perspective on goal content, such as the Exercise Motivations Inventory (Markland & Ingledew, 1997), the Motivation for Physical Activity Measure-Revised (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997) and the Reasons for Exercise Inventory (Silberstein, Striegel-Moore, Timko, & Rodin, 1988). The development of the GCEQ therefore addressed and filled a gap in the SDT measurement literature for a theoretically aligned questionnaire with which to measure intrinsic and extrinsic exercise goals.

The GCEQ was developed and validated in a series of three studies. This work represents the first goal content questionnaire in the SDT literature to be systematically developed from first principles and validated through a series of studies. A pool of items gleaned from a content analysis of existing measurement tools was developed and a focus group of exercisers was employed to gain further insight in different goals that might be pursued when exercising. Using exploratory and confirmatory factor analyses in a sample of 666 adults, the original item pool was reduced to 20 items which represented internally consistent intrinsic goal factors of health management, skill development and social affiliation and extrinsic goal factors of image and social recognition. Social affiliation and social recognition goals consistently displayed lower mean importance ratings than the other three goals (health development, skill development and appearance). It may have been that the participants sampled participated in less group exercise in favour of more individual exercise modes and as such goals referring to social interactions held less relevance. Such goals may be particularly relevant in group exercise such as aerobics classes which represent an interesting avenue for future research employing the GCEQ. The measurement and structural parameters of the GCEQ were found to be invariant across gender. In an additional sample of 475 adults the internal validity (i.e., factor

structure) of the GCEQ scores was supported via confirmatory factor analysis. The external validity of the scores derived from the GCEQ was also supported in this sample through correlations with variables which were aligned with hypothesised relationships from within the nomological network of SDT (i.e., psychological needs and behavioural regulations). While correlations were observed as expected between intrinsic goals and competence and relatedness need satisfaction, the correlation with autonomy need satisfaction was non-significant. A possible explanation for this observation might be that while the goals of skill development and social affiliation can be clearly linked to competence and relatedness need satisfaction respectively, none of the goals link to autonomy need satisfaction in such a direct fashion. Despite this possibility, in line with SDT it was hypothesised that all of the intrinsic goals would be pursued with a greater degree of freedom and authenticity than the extrinsic goals even without an explicit link to autonomy need satisfaction. Finally, in a sample of 110 university students, scores from the GCEQ were shown to be temporally stable over a one-month period. The factor structure of the GCEQ gained further support through confirmatory factor analysis among a large sample of adults conducted as part of the preliminary analyses of Study 2 (Chapter 4).

The GCEQ achieves conceptual clarity by facilitating the measurement of the importance individuals place on intrinsic and extrinsic goals without the contamination of theoretically distinct items and factors indicative of autonomous and/or controlled behavioural regulation. Consequentially, the existing SDT-based measurement literature, which includes measures of exercise-based behavioural regulation and need satisfaction, is advanced by the addition of the GCEQ, facilitating comprehensive testing of hypotheses derived from SDT.

7.2.2 The Correlates of Intrinsic and Extrinsic Exercise Goals

It is forwarded in SDT that the pursuit of intrinsic, relative to extrinsic, goals will result in adaptive cognitive, affective and behavioural outcomes (Deci & Ryan, 2000; Vansteenkiste, Lens, & Deci, 2006). This hypothesis was examined quantitatively for the first time in the exercise context in Studies 2 and 4 (Chapters 4 and 6 respectively). In Study 2, cross-sectional analysis in a sample of 401 adults revealed that placing greater importance on intrinsic, relative to extrinsic, exercise goals as measured by the GCEQ was positively associated with physical self-worth, subjective well-being (viz. an index of happiness/depression and vitality) and self-reported leisure-time exercise and negatively associated with exercise-based anxiety.

Previously, there was no evidence to support these relationships in the exercise context and the findings are in line with those identified in research of intrinsic and extrinsic goal pursuit at the global life level (Kasser & Ryan, 1993, 1996) and at the contextual organisational level (Vansteenkiste, Neyrinck et al., 2007).

To further understand why relative intrinsic goal pursuit was associated with these adaptive outcomes, psychological need satisfaction (i.e., the satisfaction of autonomy, competence and relatedness) was tested as a possible mediating mechanism. In scrutinising such motivational dynamics, this research responds to calls for the advancement of health behaviour change research through the analysis of theory-based mediators (Ryan, Patrick, Deci, & Williams, 2008). In line with the organismic principles forwarded in SDT which suggest that intrinsic goal pursuit is a growth oriented process and as such will satisfy one's innate psychological needs, relative intrinsic exercise goal importance was positively associated with exercise-based psychological need satisfaction. This relationship partially mediated the effect of relative intrinsic goal content on physical self-worth, psychological well-being and exercise anxiety.

This study was among the first to examine the relationship between relative intrinsic goal content and psychological need satisfaction in the exercise domain. The findings of Study 2 support observations in other contextual level settings such as the findings of Vansteenkiste, Neyrinck et al. (2007) that intrinsic versus extrinsic work goal pursuit is positively associated with psychological need satisfaction in the workplace. In addition, the findings also support observations at the global level, such as the findings of Thøgersen-Ntoumani, Ntoumanis, and Nikitaras (in press) that reveal that the importance placed on health, but not image, life aspirations by adolescent girls is positively related to their global psychological need satisfaction. Together, these findings add strength to the contention of Vansteenkiste et al. (2006) that the pursuit of intrinsic goals represents a third manifestation of the human growth orientation postulated in SDT, the other two being the *internalisation process* and *intrinsic motivation* (Vansteenkiste et al., 2006). In addition, the findings of Study 2 add to the growing body of literature supporting the tenets of Basic Needs Theory; that psychological need satisfaction is positively associated with subjective well-being (Ryan & Deci, 2002).

An explanation for the positive association between intrinsic relative to extrinsic goal content and psychological need satisfaction could be that the pursuit of

extrinsic goals such as projecting an attractive appearance or being socially recognised for one's exercise efforts depletes one's psychological and time-based resources. Sheldon et al. (2004) suggest that as time and energy are limited resources, putting forth effort into pursuing extrinsic goals "crowds-out" and takes up time and energy that could be focused towards more energising intrinsic goal pursuits. Supporting this possibility, in Study 2 it was observed that relative intrinsic goal importance correlated positively with a psychological well-being composite including a measure of vitality which Nix, Ryan, Manly, and Deci (1999) describe as an indicator of having free psychological resources and energy. These authors identified that an internal locus of causality was positively associated with perceptions of subjective vitality whereas an external locus of causality was not. Nix et al. suggest that their "research points toward the restorative vitalizing potential of self-regulated action, relative to the potential for drained or diminished vitality when one's activity is controlled" (p. 282). In addition to possible direct effects of goal content on vitality and psychological resources, the association between goal content and goal regulation supports the tenability of the resource depletion hypotheses with regards to goal content. Future research, perhaps combining examinations of goal attainment in addition to importance would do well to more directly test the possibility that intrinsic and extrinsic goal strivings yield different levels of resource depletion.

7.2.3 In Search of Micro-mediating Processes

In mediating the effect of relative intrinsic goal content on outcome variables, psychological need satisfaction has been previously labelled as a *macro-mediational mechanism* (Vansteenkiste et al., 2008). In addition, the experiences, cognitive-affective processes or behaviours that intrinsic and/or extrinsic goal pursuits confer that lead to psychological need satisfaction or thwarting are termed *micro-mediational mechanisms* (Vansteenkiste et al., 2008). Owing to the establishment of need satisfaction as a macro-meditational mechanism in Study 2 (Chapter 4), qualitative methodology was used in Study 3 (Chapter 5) with the aim of adding rich phenomenological data to the dearth of information pertaining to micro-mediational mechanisms that might operate in exercise. Despite the importance of understanding mechanisms of how the pursuit of different goals relates differently to the satisfaction of basic psychological needs analysis of micro-mediational mechanisms had not been undertaken in previous SDT literature. As such, the findings of Study 3 built an

original and detailed phenomenological foundation on which future research can advance.

Perhaps owing to the fact that SDT was originally derived in part from findings of quantitative laboratory studies (Deci & Ryan, 1985) and the little accommodation offered for pre-existing theory in many qualitative paradigms, qualitative SDT-based research is rare (but see Gillison, Osborn, Standage, & Skevington, 2009; Ntoumanis, Pensgaard, Martin, & Pipe, 2004 for examples). Using a method such as Interpretative Phenomenological Analysis, that recognises the theoretical knowledge of the researchers, qualitative methods were highly appropriate for the exploration and development of micro-mediational processes that may explain the relationship between goal content and psychological need satisfaction observed in Study 2 (Chapter 4).

Semi-structured interviews were conducted with five male and six female adults who were currently pursuing relative intrinsic goals or relative extrinsic goals. The lived experiences of the participants were analysed using Interpretative Phenomenological Analysis (Smith & Osborn, 2003) which allowed the integration of theoretical information when forming themes from the interview data. Two domains emerged; Domain 1 was labelled *Social factors* and comprised the sub-themes of *Observation of others and Emotions following observations or interpersonal comparisons*. Domain 2, *Goal progress*, comprised the sub-themes of *Expectations and beliefs*, *Markers of progress* and *Reactions to (lack of) goal achievement*. The experiences on which these themes were based provided support for, extended and added to previously hypothesised cognitive-affective processes. Specifically, in line with the postulations made by Vansteenkiste, Soenens, and Lens (2007) of an attentional shift away from the exercise in hand and towards external indicators of worth, the narratives of the exercisers focused on relative extrinsic goals suggested that they made more social comparisons than did the narratives of the exercisers focused on relative intrinsic goals. However broadening this picture, our detailed qualitative data also suggested that both the content of, and reason for, social comparison during exercise were also different between the intrinsic and extrinsic goal groups. These exercise-based processes were linked within the interview data to inspirational and deflating emotional responses respectively. In addition, while making social comparisons, many of the extrinsic exercisers reported what Kasser (2002) referred to as an objectification of others, in which they viewed others as a

collection of individual body parts that were either more or less perfect in appearance than theirs. Comparisons to these individual body parts were used as a means of gathering information about how close they were getting to their desired appearance. Such processes are unlikely to lead to relatedness or connections with others and were not revealed as part of the intrinsic goal-focused participants' exercise experiences.

The participants' narratives also differed with regards to their attitudes and experiences of goal progress. Specifically, differences in expectations of goal attainment, assessment of goal progress and reactions to (lack of) goal attainment were observed. The extrinsic goal-focused exercisers reported pursuing certain endpoints to their exercise such as a certain body shape or fitting into a favourite item of clothing. However, many doubted and lacked competence in their ability to attain such desires. Intrinsic goal-focused exercisers on the other hand, attended to the process of exercising more than specific outcomes, accepting exercise as a long-term behavioural choice rather than a quick-fix, minimum effort - maximum gain behaviour. Such experiences highlighted exercise-based examples of Vansteenkiste et al.'s (2008) proposed rigid approach to extrinsic goal pursuit and showed a more flexible approach to intrinsic goal pursuit. A rigid approach may result in short-term effort, but such behaviour is likely to be characterised by superficial engagement and threats to one's competence if one does not achieve one's goal. Such experiential factors are unlikely to foster adaptive engagement in the long-term.

While intrinsic goal pursuers reported attending to internal markers with regards to evaluating their goal progress (e.g., monitoring changes in heart rate or fitness) the extrinsic goal pursuers tended to use external markers of progress such as body shape, the comments of others or perceptions of their jealousy which may thwart opportunities for relatedness. The long-term and flexible approach to goal engagement carried over to the intrinsic goal-pursuers' reactions to goal achievement. On goal achievement, these participants aspired to continue their exercise engagement by autonomously setting new, more challenging goals. In contrast, on achieving their goal, those pursuing extrinsic goals reported short-term satisfaction of their goal achievement but this was quickly followed by feelings of "what next?" and self-imposed pressure to maintain their gains.

Collectively, the findings of Study 3 (Chapter 5) built on the proposals of Kasser (2002) and Vansteenkiste et al. (2008) to provide evidence for some micro-mediational mechanisms that might accompany intrinsic and extrinsic goals for

exercise. In addition, the participants' experiences illuminated the findings of Study 2 (Chapter 4) and created a rich and solid foundation on which future research can build in more targeted investigations of cognitive-affective processes involved in intrinsic and extrinsic goal pursuit that help to explain the different relation of goal content to need satisfaction.

7.2.4 The Independent Effects of the “What” and “Why” of Exercise Goals

In Studies 1 and 2, intrinsic and extrinsic goals (i.e., the *what*) were found to be positively correlated with autonomous and controlled behavioural regulations (i.e., the *why*) respectively. These findings corroborated previous observations made at the global level (Sheldon & Kasser, 1998; Sheldon, Ryan, Deci, & Kasser, 2004). Given this relationship, and that there is debate as to whether the effects of goal content on well-being are reducible to the behavioural regulation that underpin goals (e.g., Carver & Baird, 1998), in Studies 2 and 4 (Chapters 4 and 6 respectively) this hypothesis was investigated in the exercise context. This analysis represented the first contextual direct test of the independence of the “what” and “why” and was in line with recent calls made by Vansteenkiste et al. (2008) that independent effects of goal content and goal motive may differ depending on the domain (e.g., exercise goals vs. general life aspirations) and outcome variable being studied.

In Study 2, commensurate with previous research showing independent effects of goal content and behavioural regulation on psychological well-being (Sheldon et al., 2004) the effects of goal content on physical self-worth, exercise anxiety and psychological well-being remained above and beyond the effects of behavioural regulation. In contrast, evidence for independence was not identified in the prediction of self-reported leisure-time exercise behaviour. Although this finding was aligned with that of Ingledew and Markland (2008), other studies have identified independent effects of goal content and behavioural regulation on exercise behaviour (Gillison, Standage, & Skevington, 2006). As such, Study 4 was conducted to explore this issue in greater depth by remediating the use of self-report behavioural measures and cross-sectional study design as has been the case in previous studies based on individual differences.

Advancing over much previous SDT-based research in the exercise domain, in Study 4, moderate-to-vigorous physical activity, indicative of the intensity of exercise behaviours was measured objectively via accelerometry. In addition, accelerometer data were also triangulated with subjective (i.e., activity log) data in line with recent

recommendations (Pettee, Storti, Ainsworth, & Kriska, 2009) to address limitations of using accelerometry data alone. This represents the first study to adopt such triangulation procedures in the exercise-based SDT literature.

In addition, a prospective design was used in which goal content and behavioural regulations were measured one week before the 7-day behavioural assessment began. In contrast to the findings in Study 2, relative intrinsic goal content did not display a direct relationship with exercise behaviour. However, consistent with the previous studies in the thesis and those in the broader literature, relative intrinsic goal content was moderately positively associated with autonomous behavioural regulation which shared a positive association with exercise behaviour. Autonomous behavioural regulation carried a specific indirect effect from relative intrinsic goal content to exercise behaviour. The findings pertaining to behavioural regulation and objectively assessed behaviour were in line with recent findings of Standage, Sebire and Loney (2008) who assessed exercise behaviour using the Actiheart device which combines concurrently measured heart-rate and accelerometer to accurately predict energy expenditure.

Through the prospective design and objective behaviour measurement, the results of Studies 2 and 4 add to and build on those of Ingledew and Markland (2008) who studied a similar population of adults from the United Kingdom. Collectively, these findings provide evidence gathered using different measures of goal content and both subjective and objective behavioural assessment to support a sequential model in which exercise goal content effects exercise behaviour through behavioural regulation. One explanation for the small magnitude of independent variance predicted in outcomes by relative intrinsic goals may be that pursuing a need-satisfying intrinsic goal with an un-need satisfying controlled behavioural regulation represents a psychological conflict that is difficult to pursue compared to a match between one's goal content and behavioural regulation (i.e., intrinsic goals for autonomous regulations vs. extrinsic goals for controlled regulations). From this perspective it would be difficult for an individual to hold need satisfying goals and regulate them in un-need satisfying ways.

Given the observation of significant but small effects of goal content on exercise-based cognitive and affective outcomes over and above behavioural regulation in addition to the lack of independent effects on exercise behaviour, a question might be raised about the utility of the goal content construct when

considering optimal functioning in exercise. However, it would be premature to disregard the concept of goal content in the study of exercise motivation for a number of reasons.

First, the perspective in SDT that all goal pursuit is not necessarily adaptive differs from other theoretical perspectives such as expectancy-value theories (e.g., Carver & Scheier, 1998; Eccles & Wigfield, 2002) in which valued goal achievement, regardless of goal content is the key predictor of positive outcomes. SDT therefore allows researchers to consider adaptive and maladaptive goal pursuit in greater detail. Second, as autonomous forms of motivation towards exercise have been shown to have many adaptive effects (see Hagger & Chatzisarantis, 2007), given that intrinsic goals positively correlate with autonomous motivation, goal content presents an avenue for individuals to develop adaptive motivation for exercise (see Section 7.3). In addition, as some effects of goal content on adaptive and maladaptive outcomes were observed over and above goal motive then intrinsic goal pursuit may have multiple pathways to optimal functioning in exercise (e.g., direct effects, through psychological need satisfaction and through more self-determined behavioural regulation). Third, the qualitative findings of Study 3 (Chapter 5) identified clear cognitive, affective and phenomenological ramifications of relative intrinsic and extrinsic goal pursuit in exercise. In addition to the independent effects of relative intrinsic goal content on cognitive and affective outcomes identified in Study 2, this suggests that goal content influences the experiential side of exercise which may, in the long-term influence behavioural adherence. Fourth, although not studied in the present research, it is clear that both intrinsic and extrinsic exercise goals can be promoted by social agents (e.g., the media, practitioners, parents and peers) and in social environments (e.g., gymnasiums, exercise classes) (e.g., Raedeke, Focht, & Scales, 2007; Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004). The concept of goal content facilitates the critique of these environments and analysis of the psychological consequences of residing in such social contexts. Finally, in an applied setting, the concept of intrinsic and extrinsic goals may be more easily understood by practitioners than the full range and ramifications of the six different types of behavioural regulation and therefore represent a useful avenue for intervention.

Together, the studies presented in this thesis make a unique contribution to the literature through providing a comprehensive analysis of goal content within the exercise domain using SDT as a theoretical foundation. The findings provide evidence

to support some of the relationships recently hypothesised by Ryan, Patrick, Deci, and Williams (2008) in the SDT model of health behaviour change (Figure 1.1, Chapter 1). Specifically, for the first time, relationships between relative intrinsic exercise goal content and psychological and physical criterion variables were identified. In addition the hypothesised role of psychological need satisfaction in mediating these relationships was also identified in the exercise context. Previously this hypothesis was only tested in the organisational domain with measures adapted for that context (Vansteenkiste et al., 2007). Therefore the test of psychological need satisfaction as a mediator using context specific validated questionnaires in Study 2 represents advancement in the literature. Through providing evidence to support these pathways, in addition to original person-centred insight into micro-mediational cognitive-affective processes and the independence of goal content and goal motive (at least for non-behavioural outcomes), the present work contributes to the understanding of the context of exercise goals and highlights the utility of the concept of intrinsic and extrinsic goal content in the understanding of exercise motivation.

7.3 Practical Applications

The present thesis contributes some of the first comprehensive extensions of the goal content principles forwarded in SDT to the exercise domain. Although much future research is needed, the present findings and those of recent studies can be drawn upon to make tentative recommendations for practitioners in applied settings.

A key feature of SDT is the dialectical foundations that it is based upon which suggest that environmental interactions can influence one's motivation (Deci & Ryan, 2000). Such principles open up a role for practitioner-based intervention. As it was found in the present studies that exercisers' goal content accounted for variance in cognitive, affective and behavioural variables directly and indirectly through their associated behavioural regulation, goal content may represent an active ingredient for possible exercise-based intervention. While future work needs to establish whether it is possible for an external agent (i.e., a GP or health trainer) to help an adult exerciser change their goal content, evidence from goal manipulation studies in children and young adults (e.g., Vansteenkiste, Simons, Lens et al., 2004; Vansteenkiste, Simons, Soenens, & Lens, 2004) suggests that goal content is malleable to change.

Before such evidence is available in an adult sample, in line with the recommendations of Niemiec, Ryan and Deci (in press) from their study of life-goals, the findings of the present investigations suggest that practitioners might do well to help those who are in the early stages of exercise adoption, or those who find exercise maintenance difficult, to assess their goals for exercise and encourage the adoption of intrinsic rather than extrinsic goals. It would appear that if exercisers can be encouraged to see the long-term relevance of adopting and pursuing goals for physical health, social affiliation or development of skills rather than goals for social recognition or appearance augmentation, then their exercise experiences may be largely adaptive.

Theoretical postulations and empirical findings suggest that there may be potential for practitioners to be successful in encouraging individuals to pursue intrinsic rather than extrinsic goals. In particular, within SDT it is contended that individuals have an innate tendency to experience growth (Deci & Ryan, 2000). Additionally, the observation in Study 2 that valuing intrinsic relative to extrinsic goals in exercise is positively associated with psychological need satisfaction adds support to the proposal of Vansteenkiste et al. (2006) that the pursuit of intrinsic goals may be a key growth-oriented process. Indeed, Sheldon, Arndt, and Houser-Marko (2003) have referred to this tendency as an *organismic valuing process* and have provided empirical evidence to support the movement towards intrinsic goals and away from extrinsic goals over time. As such, interventions to promote the pursuit of intrinsic rather than extrinsic goals may be effective because they would capitalise on individuals' innate tendencies towards optimal functioning.

Within SDT, a number of guidelines for creating *autonomy-supportive* client-practitioner interactions are forwarded to enhance the internalisation of a given behaviour and thus facilitate autonomous behavioural regulation. Specifically, factors such as providing a meaningful rationale, empathetically acknowledging the individual's feelings and providing choice have been shown to enhance internalisation (Deci, Eghrari, Patrick, & Leone, 1994). Given the relationship identified between relative intrinsic goal content and more autonomous forms of behavioural regulation in the present thesis, encouragement to pursue meaningful and realistic intrinsic, rather than extrinsic, goals may represent a useful addition to the list of other social preconditions that are shown to promote internalisation. However, in line with recommendations for the provision of empathy, Ingledew and Markland (2008)

correctly point out that if an exerciser has developed extrinsic goals, these goals should not be belittled. Rather the practitioner should acknowledge that extrinsic goal pursuit is understandable and common to many people while encouraging the exerciser to think about whether they are able to achieve their extrinsic goal strivings and whether pursuing such goals would really be associated with the positive outcomes that they expect.

There is empirical evidence supporting the effectiveness of intrinsic goal promotion combined with such autonomy-supportive delivery styles. Specifically, Vansteenkiste, Simons, Lens et al. (2004) identified that the adaptive learning and motivational effects of intrinsic goal content manipulations were enhanced when they were delivered using autonomy-supportive language such as “if you choose” and “you might” rather than externally controlling language such as “you must” and “you have to.” Notwithstanding the requirement for future research regarding exercise goal promotion strategies in adults, it appears that practitioners efforts to change exercise-based attitudes and behaviours may be enhanced by considering the concepts of goal content from the SDT perspective.

7.4 Limitations and Future Directions

The particular limitations of the four studies presented in this thesis were considered individually in Chapters 3 to 6. Therefore, this section aims to discuss more general limitations to the collective body of work and integrate these with avenues for future research.

7.4.1 Longitudinal Research and Bi-directional Effects

The majority of the work presented in this thesis was cross-sectional in design and focused on observing the relationships between goal content and outcome variables from an individual difference perspective. Such cross-sectional methodology, while appropriate for the questions posed in the present thesis, prevents conclusions regarding cause and effect between goal content and the outcome variables from being established.

Indeed the mediational pathways tested within Study 2 (Chapter 4) only examined one side of the proposed relationship between goal content and need satisfaction. From the SDT perspective, the relationship between relative intrinsic goal content and psychological need satisfaction is bi-directional. Specifically, in addition

to relative intrinsic goal pursuit being conducive to psychological need satisfaction, which was tested in Study 2 (Chapter 4), there is evidence that experienced environmental need-support is associated with the pursuit of goals with different content (Kasser, Koestner, & Lekes, 2002; Williams, Cox, Hedberg, & Deci, 2000). While we tested a model in which goal content acted as an antecedent of psychological need satisfaction, the cross-sectional nature of the data collected does not rule out the possibility that differential exercise-based need satisfaction leads to the pursuit of different exercise goals. It has been previously suggested that extrinsic goals may be pursued as a substitute for one's thwarted psychological needs (Williams et al., 2000). Building on research showing that it is possible to create autonomy-supportive exercise environments (Edmunds, Ntoumanis, & Duda, 2008), future research could experimentally examine the effect of environmental need satisfaction/thwarting on intrinsic and extrinsic goal selection. In addition, longitudinal work employing multiple measures of goal content and psychological need satisfaction would also provide information with regards to their reciprocal effects.

In Study 4 (Chapter 6) a prospective design was adopted and data were collected over 16 days with a one week delay between measurement of goal content and exercise behaviour. However, the evidence pertaining to the correlates of goal content would be strengthened by longitudinal and experimental research. Recently, longitudinal research has highlighted that the relationships between goal content, mediators such as psychological need satisfaction and outcomes such as well-being can be studied over time (Niemic et al., *in press*). It would be particularly interesting to extend this line of research to the longitudinal study of exercise goal content. Specifically, in line with the work of Niemic et al. (*in press*), if goal content, psychological mediators and objective exercise behaviour are measured at baseline and at multiple follow-up points over the period of a year for example it would be possible to assess whether change in exercise goal content predicted change in the psychological mediators and change in exercise behaviour.

Multiple follow-up behavioural assessments would advance the one-shot measurement of behaviour employed in the present thesis (*i.e.*, 7-day recall or 7-day accelerometer assessment). In doing so, more detailed information could be gleaned with regards to the long-term effect of intrinsic and extrinsic exercise goal importance. For example in the short-term it is possible that intrinsic and extrinsic goals might

motivate exercise behaviour. However, the negative experiences and psychological consequences associated with extrinsic goal pursuit in addition to their associated controlled behavioural regulation (as highlighted in the present thesis) suggests that such goals are unlikely to support sustained behavioural engagement. Longitudinal study design would also strengthen behavioural assessments as taking multiple objective assessments of physical activity over the course of a year for example would allow for other sources of variance in physical activity (e.g., seasonal variation) to be accounted for (Mattocks et al., 2007).

Longitudinal research concerning goal content would be particularly informative if the entire conceptual model forwarded by Ryan et al. (2008) and presented in Figure 1.1 was tested. Such work might offer insight in to the long term effects and interactions of environmental, personality and individual difference facets of intrinsic versus extrinsic goal pursuit on physical and mental health outcomes using psychological need satisfaction as a mediator. Associated with the need for greater understanding of the antecedents to intrinsic and extrinsic goal pursuit, this line of work would do particularly well to examine social contextual (i.e., autonomy supportive vs. controlling motivational climates or intrinsic vs. extrinsic goal promotion) effects on exercise goal pursuit in adults.

7.4.2 Experimental Exercise Goal Framing in Adults

To advance beyond the cross-sectional methodology employed in the studies within this thesis, it would be an exciting avenue of future work to consider the experimental manipulation of exercise goal content in adult samples. Previous experimental studies in educational settings have shown that the goals of individuals from 11 to 19 years old for learning a certain activity can be manipulated by using simple paragraphs of text containing goal manipulations (Vansteenkiste, Simons, Lens et al., 2004; Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005). Future research would do well to examine the efficacy of such experimental goal framing in an adult samples with reference to their goals for exercise. This may be particularly interesting given that exercise is somewhat of an intermittent behaviour for many adults characterised by a number of unsuccessful attempts to establish regular routine. In addition, adults opinions about- and goals for exercise may be well-developed and thus potentially more difficult to change than those of children and young adults.

It would also be interesting to test a range of goal framing strategies for example written text, text with relevant pictures (e.g., an exerciser wearing tight fitting

clothing and looking in a mirror for the extrinsic goal manipulation), verbal communications and audio-visual communications such as music videos to examine whether goal framing can be achieved in different ways. A good foundation for investigations of exercise based goal framing using different media is the work of Berry and Howe (2004) who have experimented with the use of video to provide participants with persuasive messages regarding the health and appearance benefits of exercise. In this study, exposure to the health-based video had positive effects on social physique anxiety and self-presentation for exercisers, whereas exposure to the appearance-based video had negative effects on social physique anxiety and self-presentation for non-exercisers. Such work would make clear theoretical advances by allowing for a more complete test of Ryan et al.'s (2008) model of health behaviour change and have strong applied inferences for practitioners generating health promotion literature, and for those working with exercisers and in exercise environments. In addition, this work would provide evidence pertaining to cause and effect of goal content on outcomes.

The discussion regarding intrinsic and extrinsic goal manipulation so far reflects the broader approach to goal pursuit taken in the present thesis, that intrinsic and extrinsic goal pursuit is a conscious process. This highlights a limitation of the present work as there is a growing body of work supporting the nonconscious activation and pursuit of behavioural goals (e.g., Bargh, Gollwitzer, Lee-Chai, Barndollar & Trötschel, 2001). These authors suggest that "...just as most other areas of psychology recognize the nonconscious activation of mental representation, so too it is possible that goal representations do not need always to be put into motion by an act of conscious choice" (p. 1014). Recently Levesque, Copeland, and Sutcliffe (2008) have reviewed research examining the nonconscious priming of motivational regulations forwarded in SDT. These authors provide evidence that autonomous and controlled forms of motivation can be nonconsciously primed via participants undertaking a Scramble Sentence Test which contains words related to the motivational orientation (e.g., "choice", "autonomy", "freedom" primes for autonomous motivation and "pressure", "forced" and "obligated" for controlled motivation"). Nonconscious primes for controlled motivation resulted in participants finding a subsequent puzzle task less interesting and they spent less time working on it compared to participants who received the autonomous motivation primes. To date, no work has been conducted to investigate the efficacy and effectiveness of nonconscious

priming of intrinsic and extrinsic goals. This line of research is a fruitful avenue of work and would add to the conscious goal promotion work of Vansteenkiste and colleagues (e.g., Vansteenkiste, Simons, Lens et al., 2004).

Levesque et al. (2008) suggest however that researchers should take account of the effect of mindfulness (i.e., attentiveness to / awareness of what is presently taking place) as it was identified that this construct moderated the negative effect of nonconscious primes for controlled motivation. It is feasible therefore to expect that mindfulness could also play a moderating role in the effect of nonconscious primes for extrinsic goals for appearance for example. Future experimental work is required to test these possibilities.

7.4.3 Goal Attainment

A further limitation is that in the present thesis, only intrinsic and extrinsic goal importance was assessed whereas other researchers have also considered the effects of attaining intrinsic and extrinsic goals (e.g., Niemiec et al., in press; Sheldon & Kasser, 1998). Evidence gleaned from the qualitative data gathered in Study 3 (Chapter 5) suggested that both the competence to attain goals and reactions to (lack of) goal attainment were different in those who valued relative intrinsic and relative extrinsic goals. The flexible approach to goal attainment and focus on processes of exercise helped the intrinsic goal-focused participants to feel confident in their expectations to achieve their goal, remain motivated in the face of little progress and to set new challenges on goal achievement. In contrast, the extrinsic goal-focused exercisers revealed contradictory perceptions regarding their ability to attain their goal, and only short-term satisfaction on goal achievement followed by self-imposed pressure to maintain their gains. It could be suggested that the different correlates of intrinsic and extrinsic goals observed in the present work could be due to differences in the attainment of these goals. The lived experiences observed in Study 3 suggest, in line with previous research that has shown no benefit to well-being on attainment of extrinsic goals (e.g., Niemiec et al., in press; Sheldon & Kasser, 1998), that attainment of exercise goals might represent an interesting avenue of future research. It may be particularly interesting to assess the short-term and long-term consequences of intrinsic and extrinsic goal attainment. Diary procedures such as those used by Sheldon, Ryan, and Reis (1996) would represent a useful methodology to capture the temporal effects of intrinsic and extrinsic goal pursuit. For example, weekly reports of goal attainment experiences in addition to short- and long-term cognitive-affective

measures may be a novel way of gaining detailed insight in to the dynamics of intrinsic and extrinsic goal attainment in exercise settings. An alternative method of assessing intrinsic and extrinsic goal attainment in exercise would be to develop the GCEQ further to include a likert scale that allows participants to rate the degree to which they have already attained each goal. Measures of life domain goal content such as the Aspirations Index (Kasser & Ryan, 1996) have been adapted in this way.

7.4.4 Measurement of Exercise Goal Content and Motivational Profiles

Scale development is an ongoing process (DeVellis, 1991). As such, further development of the GCEQ could lead to more diverse examination of goal content in exercise through a number of pathways. First, future work with the GCEQ might aim to explore further goals that may be classified as intrinsic and extrinsic. While it is forwarded in SDT that it is not possible to define all goals in line with the intrinsic and extrinsic definitions (Ryan, Huta, & Deci, 2008), Grouzet et al. (2005) broadened the range of intrinsic and extrinsic goals previously identified by Kasser and Ryan (1996) in the general life domain. Future research could examine whether this is necessary with the regards to the GCEQ. For example, individuals also take part in exercise with the goal of relaxing from the days' stresses and improving their mood, especially as they become more experienced in exercise (Hsiao & Thayer, 1998). It would seem that this goal might be intrinsic rather than extrinsic but future work is needed to establish whether this is the case.

Second, as discussed in Chapters 1 and 3, weight-loss is a common goal for exercise (Lowry et al., 2000) but this goal might be underpinned by extrinsic goals for a certain appearance or intrinsic goals for physical health (O'Brien et al., 2007). As such, given that weight-loss is ambiguous with regards to its content it was not included in the GCEQ, future work using the GCEQ would do well to explore this further. Owing to the content ambiguity of weight-loss goals, it would be prudent and useful to develop a separate weight-loss goal content questionnaire which would allow the analysis of separate intrinsic and extrinsic weight-loss goals. This would be more advantageous than simply adapting the GCEQ to include a pure weight-loss goal domain under the presumption that this goal is extrinsic as in previous questionnaires such as the Exercise Motivation Inventory (Markland & Ingledew, 1997). Vansteenkiste (2005) experimentally exposed obese children to intrinsic or extrinsic goals for losing weight and observed that those exposed to intrinsic versus extrinsic goal framing showed adaptive changes in eating and exercising behaviours. Such

findings, point towards the necessity to develop a measure of intrinsic and extrinsic goal content for weight-loss.

Third, it would be interesting to explore the potential for different methods of measuring exercise goal content. The GCEQ represents a nomothetic approach whereby participants rate researcher-defined goals, whereas researchers studying life goals have also used ideographic methods (e.g., Sheldon et al., 2004). In ideographic methods, participants list a number of personal projects (Little, 2007) they are currently pursuing and then rate each project with regards to how likely is it that the project will lead them to possible futures which represent intrinsic or extrinsic goals. Exploring the use of other measurement techniques would add to the richness of evidence pertaining to the correlates of intrinsic and extrinsic goal pursuit in exercise.

Finally, an alternative approach to the study of motivation is to use cluster analysis to form groups of individuals who possess a similar profile of motivational variables. Between-groups analysis is then performed on the means of variables of interest to establish the effects of certain goal profiles (e.g., Ntoumanis, 2002; Vansteenkiste, Sierens, Soenens, Luyckx, & Lens, in press). Extending the cluster analysis perspective to the study of exercise goal content would be informative for two reasons. First, it would be interesting to explore the types of goal profiles that exist when considering intrinsic and extrinsic exercise goals. For example, it is important to establish whether or not the theoretical four combinations of intrinsic and extrinsic goal endorsement (i.e., high-high, high-low, low-high and low-low) would emerge. There was some evidence from the qualitative data in Chapter 5 that the majority of exercisers placed value on both intrinsic and extrinsic goals despite one goal domain clearly dominating. Second, the question of independence of goal content and behavioural regulation could be enlightened by performing cluster analysis on variables representing both motivational constructs. If the contentions pertaining to independence of goal content and behavioural regulation are to be upheld in the exercise domain, cluster profiles should emerge that are represented by the concurrent possession of intrinsic goals coupled with controlled behavioural regulation and extrinsic goals coupled with autonomous behavioural regulation.

7.4.5 Predictive Utility of Exercise Goal Content

While the present research examined the association of relative intrinsic goal content with a range of cognitive, affective and behavioural outcome variables, further research could extend this to more diverse and important outcomes. For example, in

addition to the many benefits of exercise participation, there are a number of “dark-sides” to exercise such as dependence, exercise-based calorie purging associated with eating disorders (Bamber, Cockerill, Rodgers, & Carroll, 2000) and body (or muscle) dysmorphic disorder (Choi, Pope, & Olivardia, 2002). These issues are likely to be associated with self-presentational goals related to physical appearance and social recognition rather than goals for social affiliation and health and as such it would be interesting to investigate the potential role of intrinsic and extrinsic exercise goal content might play in understanding the development of these maladaptive behaviours. There is initial evidence that supports the value of this line of research. Recently, Thøgersen-Ntoumani, Ntoumanis and Nikitaras (in press) found that the image-based aspirations of a large cohort of Greek adolescent girls were positively associated with their body image concerns which were underpinned by a drive for thinness and their body dissatisfaction. In turn, body image concerns were positively associated with unhealthy weight-control behaviour such as skipping meals and fasting. In contrast, the girls’ intrinsic goals for health were positively related to psychological need satisfaction which in turn was negatively associated with body image concerns. These concerning findings bolster the need for similar future research in adult samples.

Additionally, future research examining the correlates of intrinsic and extrinsic goal pursuit might build upon the findings of the qualitative investigation reported in Chapter 5 to quantitatively examine the highlighted micro-mediational mechanisms in more detail. Clearly such work depends on the availability of validated tools with which to measure aspects such as the competitive versus inspirational nature of interpersonal comparisons.

7.4.6 Hierarchical Model of Goal Content

The present research successfully extended theoretical concepts developed from studies of goals in the general life domain (i.e., goals at the global level) to the context of goals for exercise (i.e., goals at the contextual level). However, Vallerand suggests that a comprehensive study of motivation should include analysis of the interplay between motivation that exists at the global, contextual and situational (e.g., a particular exercise environment) levels of generality (Vallerand, 1997). Although in his model of intrinsic and extrinsic motivation Vallerand referred to behavioural regulation existing at different levels of generality, it may be informative to extend this model to the study of goal content.

Specifically, it would be interesting to explore whether intrinsic and extrinsic goal pursuit in exercise is a vehicle for more global intrinsic and extrinsic life goals/aspirations. For example, a person who places importance on life aspirations for social affiliation may join a spinning class or a walking group to facilitate the desired social connections. Alternatively someone who places importance on life aspirations for beauty may view exercise as a way of attaining their life-goal by shaping their body. By examining the inter-level dynamics of goal content, psychologists may gain a greater insight into the origins of intrinsic and extrinsic goals in different contexts and how to intervene and influence contextual goal pursuit. Such work may highlight the need for cross-level intervention where encouragement to pursue intrinsic life goals or satisfy psychological needs in general may filter down to contextual intrinsic rather than extrinsic goal pursuit. As alluded to in the Introduction section of this thesis, exercise is often advertised in the private sector (e.g., health clubs, gymnasiums) as a route to the perfect body. It is reasonable to hypothesise therefore that during times of low global psychological need satisfaction, exercise (or the perfect body that is aspired to through exercise) may be perceived as a commodity in the same way as buying a sports car would be - as a substitute for one's unsatisfied needs.

Past work (e.g., Vansteenkiste, Simons, Lens et al., 2004; Vansteenkiste et al., 2005) has shown that it is possible to frame situational goal content (i.e., towards a particular learning activity) by asking participants to read text paragraphs that contain intrinsic or extrinsic goal manipulations. In Vallerand's (1997) hierarchical model, reciprocal effects are postulated to occur between situational and contextual motivation, in that motivation at one level can influence motivation at another level. Combining this contention with Vansteenkiste's goal manipulation techniques, it may possible that by residing in exercise-based situational environments (e.g., an exercise class) in which strong extrinsic goals are promoted, a person may develop extrinsic contextual goals towards exercise in general. Future research examining the efficacy of situational manipulation of exercise goal content in adults and the interaction between goal content at the situational and contextual levels would shed more light on these hypotheses.

In addition to the examination of potential cross-level reciprocal effects of intrinsic and extrinsic goal pursuit, it would also be interesting to explore cross-contextual variations and consistency of goal content. For example it would be

interesting to understand whether one could hold intrinsic goals in one context (e.g., exercise) while holding extrinsic goals in another (e.g., work). Such insight would identify whether goal content interventions would be best targeted at the contextual or general level.

7.5 Conclusion

The study of motivation for exercise from the SDT perspective has been principally guided through examination of the degree to which exercisers' pursuits are self-determined (cf. Hagger & Chatzisarantis, 2007). However, Deci and Ryan contend that in the quest to better understand optimal human functioning, the content of people's goals is also an important consideration. The work undertaken in the present thesis aimed to systematically broaden the SDT perspective on goal content to the study of adults' exercise goals.

In achieving this objective, the present work adds to the literature pertaining to exercise motivation. Specifically, the measurement, correlates, motivational dynamics and underpinning processes of intrinsic and extrinsic exercise goals have been explored in depth. The systematic approach ensured theoretical alignment from the outset and the broad range of methodologies employed facilitated the examination of a number of theoretical hypotheses, some for the first time in the exercise context. While there remains much exciting research to be conducted, collectively the present studies provide a solid foundation of evidence that extend Ryan Sheldon, Kasser, and Deci's (1996) contention that "all goals are not created equal" (p. 7) to the exercise domain.

7.6 References

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Appendix 2

Supplementing Chapter 2 – Methodological Considerations

2.1 *Physical Activity Log*

Monitor time on _____ AM

Time	Activity	Intensity (light / moderate / vigorous)
8.00 - 8.30	<i>Brisk walk</i>	<i>moderate</i>

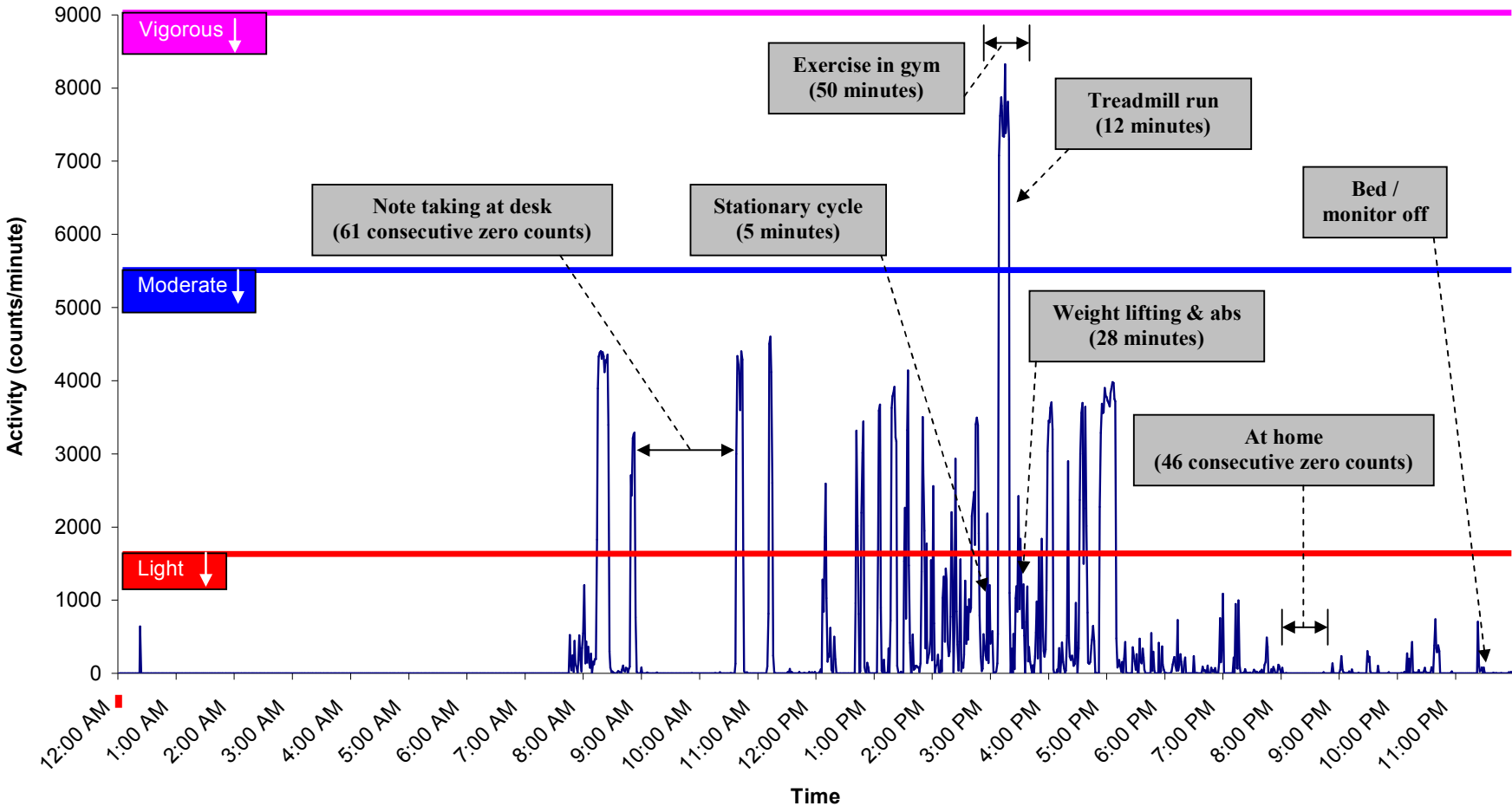
Monitor time off _____ PM

2.2 *Examples of Graphical ActiGraph Accelerometer Data and Activity Log Data*

The graphical accelerometer data presented in this appendix has been annotated with the participant's activity log data to highlight two important methodological considerations.

- A) Instances of multiple continuous zero counts > 20 minutes while the participant reported wearing the ActiGraph.
- B) The triangulation of accelerometer data with activity log data to address limitations of accelerometry by facilitating the addition of time spent in physical activities that do not involve vertical acceleration at the hip (e.g., cycling, weight-lifting).

Accelerometer data for subject AGS013
17th October 2008



Activity log data for subject AGS013

17th October 2008

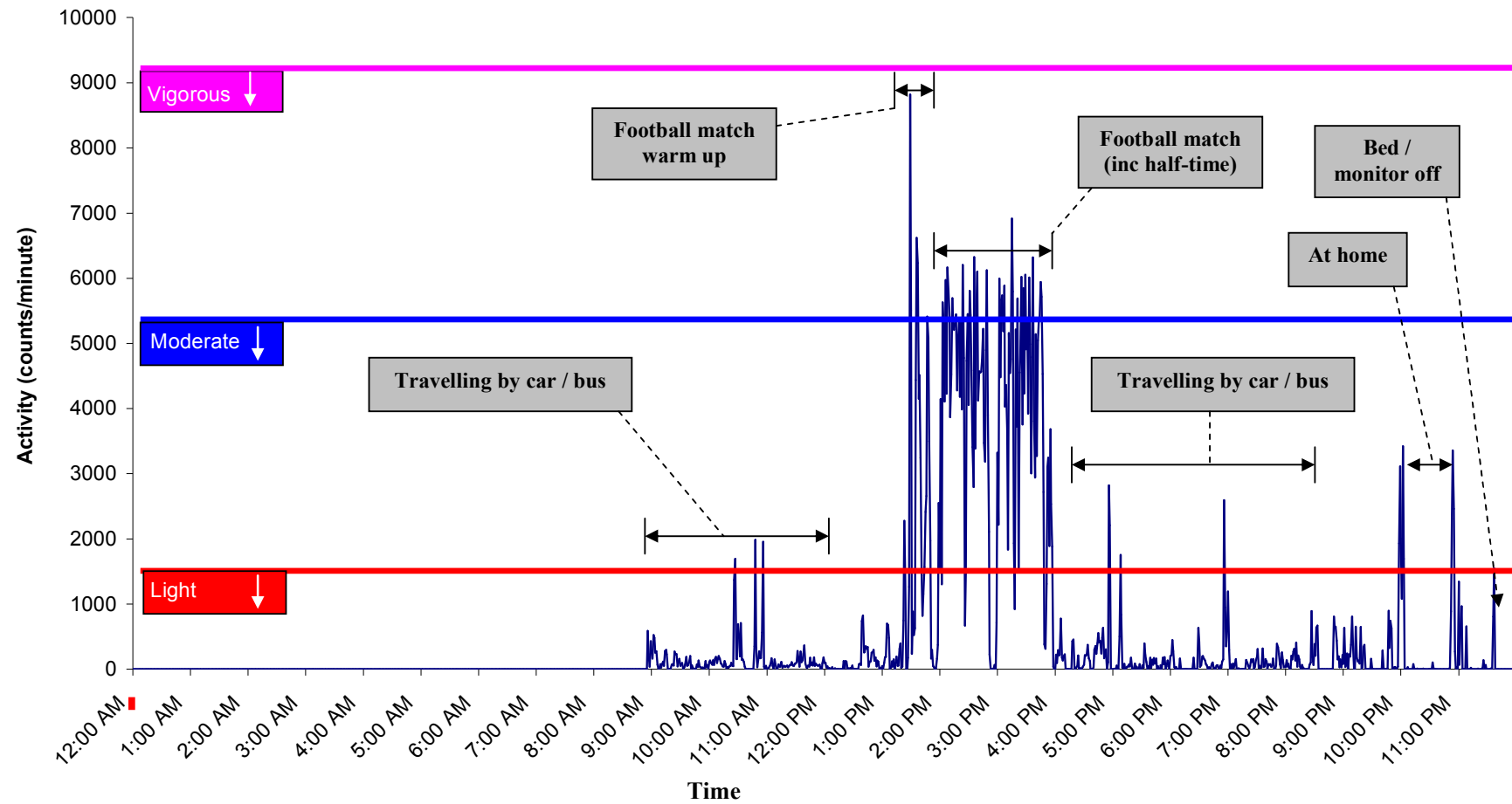
DATE: 17/10/2008.....

Monitor Time On 7:45 AM

Time	Activity	Intensity (light / moderate / vigorous)
8.00 - 8.30	Brisk walk	moderate
8:15 - 8:30	Walk	MODERATE
10:37 - 10:45	Walk	MODERATE
9:15 - 10:37	NOTE TAKING / DESK	LIGHT
11:15 - 12:15	NOTE TAKING / DESK	LIGHT
13:00 - 15:00	SHOPPING	LIGHT / MODERATE
15:00 - 15:05	BIKE	MODERATE
15:08 - 15:20	TREADMILL - RUN / INTERVAL 9-11 METS	MODERATE
15:22 - 15:50	GYM - WEIGHT LIFTING + ABS	MODERATE
16:00 - 17:15	WALKING HOME + SHOPPING	LIGHT - MODERATE
17:15 - 19:00	AT HOME - COOKING / WATCHING TV	LIGHT
* 19:00 - 19:12	TOOK IT OFF - SHOWER	
* 0:00	TOOK IT OFF - WENT TO BED	

Monitor Time Off 0:00 PM

Accelerometer data for subject AGS013
19th October 2008



Activity log data for subject AGS013

19th October 2008DATE: 19/10/08.....Monitor Time On 8:56 AM

Time	Activity	Intensity (light / moderate / vigorous)
09:00 - 13:00	TRAVELLING (CAR + BUS)	LIGHT
13:30 - 13:50	WARM UP	MODERATE
14:00 - 14:45	FOOTBALL	VIGOROUS
14:45 15:00	HALF TIME	
15:00 15:45	FOOTBALL	VIGOROUS
16:20 20:25	TRAVELLING (BUS + CAR)	LIGHT
* 20:32 - 20:49	TOOK IT OFF - SHOWER	
20:50 - 21:50	WALKING IN THE HOUSE - COOKING	LIGHT
* 23:40	TOOK IT OFF - WENT TO BED	

Monitor Time Off 23:40 PM

2.3 Participant Accelerometer Instruction Sheet**Participant Instructions****Waist-mounted Unit**

- ✓ The monitor attaches to the elastic belt and fits around your waist.
- ✓ The monitor should be positioned on your right hip (Figure 1), it is important to try to position the monitor in the same place each time you put it on.
- ✓ Please put the monitor on when you wake in the morning, wear the monitor all day, and remove the monitor when you go to bed at night.
- ✓ Do not wear the monitor when you shower, bath or take part in water sports (e.g., swimming), you can wear the monitor during all other activities.
- ✓ When you are awake please minimise the time where you are not wearing the monitor.

Figure 1 Correct monitor positioning**Daily Diary**

- ✓ Please complete the diary each day
- ✓ Record the time you put the monitor on in the morning, and the time you take the monitor off before you go to bed at night.
- ✓ Please use the diary to record the main activities you did during the day, the time you started and stopped these main activities and the intensity that you felt they were. Please record time when you do not wear the monitor and the main activities you did at these times.

Appendix 3

Questionnaires administered in Study 1 (Chapter 3)

3.1 Goal Content for Exercise Questionnaire

Exercisers might have very different goals on their minds for exercise. For example, some people are exercising because they believe that it will help them to become more appealing to others, whereas others believe it will help them become healthy.

The following questionnaire explores the kind of goals you might have in mind while exercising.

Please indicate to what extent these goals are important for you when exercising.

Please be as honest as possible.

	Not at all important		Moderately Important			Extremely Important	
1. To connect with others in a meaningful manner	1	2	3	4	5	6	7
2. To improve the look of my overall body shape	1	2	3	4	5	6	7
3. To increase my resistance to illness and disease	1	2	3	4	5	6	7
4. To be well thought of by others	1	2	3	4	5	6	7
5. To acquire new exercise skills	1	2	3	4	5	6	7
6. To share my exercise experiences with people that care for me	1	2	3	4	5	6	7
7. To improve my appearance	1	2	3	4	5	6	7
8. To increase my energy level	1	2	3	4	5	6	7
9. To be socially respected by others	1	2	3	4	5	6	7
10. To learn and exercise new techniques	1	2	3	4	5	6	7
11. To develop close friendships	1	2	3	4	5	6	7
12. To be slim so to look attractive to others	1	2	3	4	5	6	7
13. To improve my overall health	1	2	3	4	5	6	7
14. To gain favourable approval from others	1	2	3	4	5	6	7
15. To become skilled at a certain exercise or activity	1	2	3	4	5	6	7
16. To form close bonds with others	1	2	3	4	5	6	7
17. To change my appearance by altering a specific area of my body	1	2	3	4	5	6	7
18. To improve my endurance, stamina	1	2	3	4	5	6	7
19. So that others recognise me as an exerciser	1	2	3	4	5	6	7
20. To develop my exercise skills	1	2	3	4	5	6	7

3.2 *Psychological Need Satisfaction in Exercise Scale*

The following statements represent different experiences people have when they exercise. Please answer the following questions by considering how YOU TYPICALLY feel while you are exercising.

	False	Mostly False	More false than true	More true than false	Mostly True	True
1. I feel that I am able to complete exercises that are personally challenging	1	2	3	4	5	6
2. I feel attached to my exercise companions because they accept me for who I am	1	2	3	4	5	6
3. I feel like I share a common bond with people who are important to me when we exercise together	1	2	3	4	5	6
4. I feel confident I can do even the most challenging exercises	1	2	3	4	5	6
5. I feel a sense of camaraderie with my exercise companions because we exercise for the same reasons	1	2	3	4	5	6
6. I feel confident in my ability to perform exercises that personally challenge me	1	2	3	4	5	6
7. I feel close to my exercise companions who appreciate how difficult exercise can be	1	2	3	4	5	6
8. I feel free to exercise in my own way	1	2	3	4	5	6
9. I feel free to make my own exercise program decisions	1	2	3	4	5	6
10. I feel capable of completing exercises that are challenging to me	1	2	3	4	5	6
11. I feel like I am in charge of my exercise program decisions	1	2	3	4	5	6
12. I feel like I am capable of doing even the most challenging exercises	1	2	3	4	5	6
13. I feel like I have a say in choosing the exercises that I do	1	2	3	4	5	6
14. I feel connected to the people who I interact with while we exercise together	1	2	3	4	5	6
15. I feel good about the way I am able to complete challenging exercises	1	2	3	4	5	6
16. I feel like I get along well with other people who I interact with while we exercise together	1	2	3	4	5	6
17. I feel free to choose which exercises I participate in	1	2	3	4	5	6
18. I feel like I am the one who decides what exercises I do	1	2	3	4	5	6

3.3 Behavioural Regulations in Exercise Questionnaire

WHY DO YOU ENGAGE IN EXERCISE?

We are interested in the reasons underlying peoples' decisions to engage, or not engage in physical exercise. Using the scale below, please indicate to what extent each of the following items is true for you. Please note that there are no right or wrong answers and no trick questions. We simply want to know how you personally feel about exercise.

	Not true for me	Sometimes true for me			Very true for me
1. I exercise because other people say I should	0	1	2	3	4
2. I feel guilty when I don't exercise	0	1	2	3	4
3. I value the benefits of exercise	0	1	2	3	4
4. I exercise because it's fun	0	1	2	3	4
5. I take part in exercise because my friends/family/partner say I should	0	1	2	3	4
6. I feel ashamed when I miss an exercise session	0	1	2	3	4
7. It's important to me to exercise regularly	0	1	2	3	4
8. I enjoy my exercise sessions	0	1	2	3	4
9. I exercise because others will not be pleased with me if I don't	0	1	2	3	4
10. I feel like a failure when I haven't exercised in a while	0	1	2	3	4
11. I think it is important to make the effort to exercise regularly	0	1	2	3	4
12. I find exercise a pleasurable activity	0	1	2	3	4
13. I feel under pressure from my friends/family to exercise	0	1	2	3	4
14. I get restless if I don't exercise regularly	0	1	2	3	4
15. I get pleasure and satisfaction from participating in exercise	0	1	2	3	4

3.4 *Marlow-Crowne Social Desirability Scale (10 item)*

Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is true or false for you.

1. I never hesitate to go out of my way to help someone in trouble.	TRUE	FALSE
2. I have never intensely disliked anyone.	TRUE	FALSE
3. There have been times when I was quite jealous of the good fortune of others.	TRUE	FALSE
4. I would never think of letting someone else be punished for my wrong doings.	TRUE	FALSE
5. I sometimes feel resentful when I don't get my way.	TRUE	FALSE
6. There have been times when I felt like rebelling against people in authority even though I knew they were right.	TRUE	FALSE
7. I am always courteous, even to people who are disagreeable	TRUE	FALSE
8. When I don't know something I don't at all mind admitting it.	TRUE	FALSE
9. I can remember "playing sick" to get out of something.	TRUE	FALSE
10. I am sometimes irritated by people who ask favours of me.	TRUE	FALSE

Appendix 4

Additional Questionnaires Used in Study 2 (Chapter 4) and supplementary data

4.1 *Physical Activity and Sport Anxiety Scale*

Do you have any concerns about exercising?

	Extremely uncharacteristic of me		Neutral	Extremely characteristic of me	
1. I worry about what people will think of me while playing sports, even though it will not make any difference	1	2	3	4	5
2. I feel that I will humiliate myself when I play sports	1	2	3	4	5
3. I rarely worry about what kind of impression I am making on someone while exercising/working out	1	2	3	4	5
4. I am usually worried about what kind of impression I make while playing sports	1	2	3	4	5
5. I am afraid that people will find fault with my performance while playing sports.	1	2	3	4	5
6. Sometimes I think I am too concerned with what other people think about my performance while exercising/working out	1	2	3	4	5
7. I feel nervous if other people are watching me when I am exercising/ working out	1	2	3	4	5
8. I usually get nervous when I play sports in front of even a few people who are watching	1	2	3	4	5
9. I feel that I will humiliate myself when I exercise/work out	1	2	3	4	5
10. I don't want the ball to come to me when I play team sports	1	2	3	4	5
11. Other people's opinions of how well I play sports do not bother me	1	2	3	4	5
12. I feel self-conscious when playing sports	1	2	3	4	5

13. I pass the ball to a team mate when I get nervous	1	2	3	4	5
14. I couldn't care less if an audience was watching me perform	1	2	3	4	5
15. I avoid social gatherings if I think they will involve an athletic activity	1	2	3	4	5
16. I avoid exercising/working out where others can see me	1	2	3	4	5

4.2 Physical Self-Perception Profile (Physical Self-worth Subscale)

These are statements which allow people to describe themselves.

There are no right or wrong answers since people differ a lot.

First, decide which one of the two statements best describes you. Then, go to that side of the statement and check if it is just “sort of true” or “really true” FOR YOU

Really True for Me	Sort of True for Me	EXAMPLE	Sort of True for Me	Really True for Me
<input type="checkbox"/>	<input type="checkbox"/>	Some people are very competitive BUT Others are not quite so competitive	<input type="checkbox"/>	<input type="checkbox"/>

REMEMBER to check only ONE of the four boxes

1.	<input type="checkbox"/>	<input type="checkbox"/>	Some people feel extremely proud of who they are and what they can do physically BUT Others are sometimes not quite as proud of who they are physically	<input type="checkbox"/>	<input type="checkbox"/>
2.	<input type="checkbox"/>	<input type="checkbox"/>	Some people are sometimes not so happy with the way they are or what they can do physically BUT Others always feel happy about the kind of person they are physically	<input type="checkbox"/>	<input type="checkbox"/>
3.	<input type="checkbox"/>	<input type="checkbox"/>	When it comes to the physical side of themselves, some people do not feel very confident BUT Others seem to have a real sense of confidence in the physical side of themselves	<input type="checkbox"/>	<input type="checkbox"/>
4.	<input type="checkbox"/>	<input type="checkbox"/>	Some people always have a really positive feeling about the physical side of themselves BUT Others sometimes do not feel positive about the physical side of themselves	<input type="checkbox"/>	<input type="checkbox"/>
5.	<input type="checkbox"/>	<input type="checkbox"/>	Some people wish that they could have more respect for their physical selves BUT Others always have great respect for their physical selves	<input type="checkbox"/>	<input type="checkbox"/>
6.	<input type="checkbox"/>	<input type="checkbox"/>	Some people feel extremely satisfied with the kind of person they are physically BUT Others sometimes feel a little dissatisfied with their physical selves	<input type="checkbox"/>	<input type="checkbox"/>

4.3 *Leisure Time Exercise Questionnaire*

During a typical **7-Day period** (a week), how many times on the average do you do the following kinds of exercise for **more than 15 minutes** during your free time (write on each line the appropriate number)?

Times Per Week

a) STRENUOUS EXERCISE

(HEART BEATS RAPIDLY)

(e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

b) MODERATE EXERCISE

(NOT EXHAUSTING)

(e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, popular and folk dancing)

c) MILD EXERCISE

(MINIMAL EFFORT)

(e.g., yoga, archery, fishing from river bank, bowling, golf, easy walking)

2. During a typical **7-Day period** (a week), in your leisure time, how often do you engage in any regular activity **long enough to work up a sweat** (heart beats rapidly)?

OFTEN

1.

SOMETIMES

2.

NEVER/RARELY

3.

4.4 *Subjective Vitality Scale*

Please respond to each of the following statements using the response scale given below.

	Strongly disagree	Moderately disagree	Slightly disagree	Neutral	Slightly agree	Moderately agree	Strongly agree
1. I feel alive and vital.	1	2	3	4	5	6	7
2. I don't feel very energetic.	1	2	3	4	5	6	7
3. Sometimes I feel so alive I just want to burst.	1	2	3	4	5	6	7
4. I have energy and spirit.	1	2	3	4	5	6	7
5. I look forward to each new day.	1	2	3	4	5	6	7
6. I nearly always feel alert and awake.	1	2	3	4	5	6	7
7. I feel energized.	1	2	3	4	5	6	7

4.5 *Depression-Happiness Scale*

Thinking about how you have felt over the past 7 days, how frequently would you agree with the following statements?

	Never	Rarely	Sometimes	Often
1. I felt sad	0	1	2	3
2. I felt that I had failed as a person	0	1	2	3
3. I felt dissatisfied with my life	0	1	2	3
4. I felt mentally alert	0	1	2	3
5. I felt disappointed with myself	0	1	2	3
6. I felt cheerful	0	1	2	3
7. I felt that life wasn't worth living	0	1	2	3
8. I felt satisfied with my life	0	1	2	3
9. I felt healthy	0	1	2	3
10. I felt like crying	0	1	2	3
11. I felt that I had been successful	0	1	2	3
12. I felt happy	0	1	2	3
13. I felt that I couldn't make decisions	0	1	2	3
14. I felt unattractive	0	1	2	3
15. I felt optimistic about the future	0	1	2	3
16. I felt that life was rewarding	0	1	2	3
17. I felt cheerless	0	1	2	3
18. I felt that life had a purpose	0	1	2	3
19. I felt too tired to do anything	0	1	2	3
20. I felt pleased with the way I am	0	1	2	3
21. I felt lethargic	0	1	2	3
22. I found it easy to make decisions	0	1	2	3
23. I felt that life was enjoyable	0	1	2	3
24. I felt that life was meaningless	0	1	2	3
25. I felt run down	0	1	2	3

4.6 Supplementary Regression Analyses Conducted in Study 2 (Chapter 4)

Hierarchical Regression Analyses Predicting Physical Self-worth, Exercise Anxiety, Exercise Behaviour, Psychological Well-being and Psychological Need Satisfaction from Age, Gender, Intrinsic and Extrinsic Goal Content and Autonomous and Controlled Motivation

Independent variables	Dependent variables														
	Physical self-worth			Exercise anxiety			Exercise behaviour			Psychological well-being			Psychological need satisfaction		
	Adj. R^2	β	t	Adj. R^2	β	t	Adj. R^2	β	t	Adj. R^2	β	t	Adj. R^2	β	t
Step 1	.03			.03			.01			.02			.01		
Age		.10	1.96*		.08	-1.57		-.09	-1.92		.15	3.01**		-.07	-1.48
Gender		-.16	-3.18**		.18	3.64**		-.10	-2.01*		-.04	-0.71		-.08	-1.63
Step 2	.16			.13			.06			.10			.27		
Age		.07	1.58		-.04	-0.85		-.08	-1.70		.13	2.66**		-.04	-0.97*
Gender		-.16	-3.44**		.17	3.61**		-.11	-2.36*		-.04	-0.74		-.12	-2.08**
Intrinsic goals		.38	7.46**		-.27	-5.26**		.24	4.45**		.29	5.55**		.55	11.80**
Extrinsic goals		-.30	-5.82**		.32	6.12**		-.05	-0.93		-.25	-4.63**		-.09	-1.80
Step 3	.33			.25			.19			.23			.48		
Age		.03	0.66		-.00	-0.10		-.12	-2.68**		.09	1.99*		-.09	-2.43*
Gender		-.12	-2.92**		.14	3.17**		-.08	-1.80		-.00	-0.06		-.08	-2.22*
Intrinsic goals		.15	2.88**		-.11	-1.99*		-.04	-0.68		.10	1.96*		.29	6.52**
Extrinsic goals		-.17	-3.43**		.18	3.36**		-.06	1.02		-.11	-2.02*		-.01	-0.18
Autonomous Regulations		.45	9.79**		-.31	-6.43**		.39	7.70**		.35	7.18**		.51	12.65**
Controlled Regulations		-.15	-3.29**		.23	4.82**		-.12	-2.42*		-.20	-4.13**		-.02	-0.40

Note. Adj. R^2 = Adjusted R^2 . * $p \leq .05$. ** $p < .01$

Appendix 5

Materials used in Study 3 and Supplementary Data (Chapter 5)

5.1 *Pre-interview Questionnaire*

Research Study: Adult's Experiences of Exercise

The following short questionnaire asks about various aspects of you and the exercise you do. Please be as honest as possible.

Part 1: About You.

Date of Birth _____

Gender Male Female (please circle)

Ethnicity _____

Occupation _____

Marital Status Married Single Separated
(please circle) Divorced Cohabiting Widowed

Highest Education Level Received None Primary School
(please circle) Secondary School Tertiary (Further & higher education)

Part 2: Your Exercise.

How often do you exercise?

_____ Times per week _____ minutes per session

Other? _____

How long have you been exercising to this degree?

Please list the types of exercise that you do?

Where do you exercise?

Part 3: Your Exercise Goals

Exercisers might have very different goals on their minds for exercise. For example, some people are exercising because they believe that it will help them to become more appealing to others, whereas others believe it will help them become healthy.

The following questionnaire explores the kind of goals you might have in mind while exercising.

Please indicate to what extent these goals are important for you when exercising.

Please be as honest as possible.

	Not at all important		Moderately Important			Extremely Important	
1. To connect with others in a meaningful manner	1	2	3	4	5	6	7
2. To improve the look of my overall body shape	1	2	3	4	5	6	7
3. To increase my resistance to illness and disease	1	2	3	4	5	6	7
4. To be well thought of by others	1	2	3	4	5	6	7
5. To acquire new exercise skills	1	2	3	4	5	6	7
6. To share my exercise experiences with people that care for me	1	2	3	4	5	6	7
7. To improve my appearance	1	2	3	4	5	6	7
8. To increase my energy level	1	2	3	4	5	6	7
9. To be socially respected by others	1	2	3	4	5	6	7
10. To learn and exercise new techniques	1	2	3	4	5	6	7
11. To develop close friendships	1	2	3	4	5	6	7
12. To be slim so to look attractive to others	1	2	3	4	5	6	7
13. To improve my overall health	1	2	3	4	5	6	7
14. To gain favourable approval from others	1	2	3	4	5	6	7
15. To become skilled at a certain exercise or activity	1	2	3	4	5	6	7
16. To form close bonds with others	1	2	3	4	5	6	7
17. To change my appearance by altering a specific area of my body	1	2	3	4	5	6	7
18. To improve my endurance, stamina	1	2	3	4	5	6	7
19. So that others recognise me as an exerciser	1	2	3	4	5	6	7
20. To develop my exercise skills	1	2	3	4	5	6	7

Part 4: Exercise Experiences Interview

Please indicate whether you would be willing to take part in an interview with the researcher about your experiences of exercise (as outlined on the study information sheet).

(Please tick the appropriate box)

I **would be willing** to take part in an interview
about my exercise experiences

☐

I **would not be willing** to take part in an interview
about my exercise experiences

☐

If you are **willing to take part in an interview**, please indicate your preferred method by which you would like to be contacted to arrange an interview.

Name _____

Telephone ☐ Telephone Number _____

Appropriate time to call _____

Email ☐ Email address _____

Post ☐ Postal Address Line 1 _____

Line 2 _____

Line 3 _____

Line 4 _____

Postcode _____

This is the end of the questionnaire. Thank you for taking part.

Please return this questionnaire, along with your signed consent form to Simon in the envelope provided.

5.2 *Semi-structured Interview Schedule*

Introduction

- Welcome
- Background information about:
 - The study
 - The interviewer
- Interview guidelines
 - Discussion regarding exercise experiences
 - Focus is on participant experience, interviewer will facilitate
 - Can talk about anything, up to participant
 - No right or wrong answers
 - Confidentiality
 - Right to withdraw at anytime

Warm up / Exercise behaviours

- Could you describe your current exercise behaviours?
- Thinking back to when you started exercising, can you describe why you started exercising?
- What goals did you have in mind when you started exercising?
- Would you say you had a preference for certain forms of exercise?
- If you were to describe what exercise means to you, what would you say?

Exercise Environment.

- Tell me about the environment you exercise in?
- What do you like / dislike about your exercise environment?
- How do you feel in the environment you exercise in?
- What features do you prefer your exercise environment to have?
- Why do you prefer these features?
- Do you tend to exercise around other people?

During exercise

- On a typical visit to the *<enter exercise location here>* can you describe what you do before you exercise and after you exercise?

Thinking now of actually when you are exercising...

- Tell me about what do you do in a typical exercise session?
 - What do you tend to focus on during exercise?
 - What do you think about while exercising?
- Describe to me how you feel while exercising?

Goal progress

- How is your exercise going in terms of your goals?
- How do you know whether you are reaching your goals?
 - How do you feel when you reach an exercise goal?
 - How do you feel when you don't achieve an exercise goal?

- How does exercising make you feel?

Others in the exercise environment

- Tell me about how other people fit into your exercise environment.
- How does your exercise involve interaction with other people?
 - What type of interactions are these? Do you catch up with friends / do your own thing / see others?
- How do you think others see you as an exerciser?
- Do you think about the other people around you while in your exercise environment? What are you thinking?

Interview termination

- Does the participant have anything to add about their exercise experiences?
- Remind the participant of confidentiality and anonymity.
- Debrief participant as to purpose of study.
- Offer the opportunity for participant to ask questions about the study.
- Collect informed consent.
- Thank the participant.

5.3 Interview Log and Reflexive Journal

EXERCISE INTERVIEW LOG		
Participant Name:		Participant ID:
Date:	Interview Start Time:	Interview Finish Time:
Location:		
Pre-interview Notes		
<hr/>		
Interview Notes		
<hr/>		
Post-Interview Field Notes		
(Interviewer & participant mood • Interview “feeling” • Prominent points • Unexpected content • Interviewer reflection)		

5.4 *Post-qualitative-coding Participant Profiles*

Imogen

Imogen is strongly intrinsically goal driven. For Imogen, exercise is part of a routine and is a pathway to current and future physical health, fitness and skill for non-competitive sport, and mental well-being. Imogen sets her own exercise routine which is performed alone, unless occasionally with her partner. For this individual, exercise is not a purposely social activity but she interacts with acquaintances in the gym when not working out. She would exercise with others who are pursuing the same fitness goals as her in order to maintain a good work ethic and progress towards her goals. Imogen feels that her exercise-based health goals are ongoing and holds a long term perspective on these goals, while at the same time observing short term goals and seeing how these two perspectives relate. She feels satisfied when she achieves her exercise goals of working hard or reaching a certain level on the cardiovascular machine for example, and that this achievement is seen as part of a larger goal.

Isabelle

Isabelle has relative intrinsic exercise goals for health, fitness, social affiliation and skill / technique development. For this participant, exercise means self-care, health, and a social opportunity. Isabelle has a familial history of poor health (diabetes and overweight) which she seeks to avoid by exercising. There is a strong social aspect to Isabelle's exercise as it is an opportunity to catch up- and interact with friends in exercise classes. While Isabelle clearly values exercise she also creates reasons to maintain adherence (i.e., social meeting place and London marathon entry). Isabelle is aware of appearance ideals in society and reports having a somewhat negative body image, however her exercise appeared to not be directly instrumental in addressing this, being more focused towards health, fitness and affiliation. Isabelle is confident in achieving her goals and has a flexible approach to their attainment. Isabelle actively pushes herself in exercise and views hard exercise in a positive light.

Ivan

Ivan began exercise approximately 10 years ago following the diagnosis of a health condition resulting in unhealthy weight gain. Ivan exercises now as part of a routine to prevent poor health. Although he exercises alone, Ivan experiences a connection with others in the gym environment through a sharing of interests. Ivan sets his own exercise program but recruits expert help occasionally to check that his technique is correct on resistance machines. During exercise, Ivan reports focussing on posture and technique and reports an advanced personalised technique for enhancing his concentration on the exercise activity and bodily sensations during exercise. Ivan observes other exercisers pursuing appearance based workouts but does not see this as part of his exercise experience. Ivan has a flexible approach to exercise being confident that he can return to exercise following an enforced break from his routine. He is also confident that his exercise goals are achievable and are both long term (i.e. health) and short term (i.e., working hard and sweating during a session). If Ivan is unsuccessful in achieving his exercise goals, then he changes tack and persists. This individual is self-driven for exercise and seeks good quality from his workouts, he enjoys hard exercise.

Ian

The primary goal for Ian's participation in exercise is to maintain health as he ages, and additionally to work on his fitness (albeit in a non-competitive setting). Exercise means routine to Ian. He spent time in the Army previously where he was highly active participating in competitive sports such as boxing, triathlon and rugby. This participant is not involved in these activities anymore. Exercise is not a social activity unless running with friends who he has a mutual understanding of exercise goals with (he sounds very fit so may not like to exercise with friends as he may not be able to go at his own pace). Ian prefers to work hard and finds the gym busy at times as he does not want to interact with others but wishes to immerse in the exercise that he is doing. During exercise Ian tries to relax and dissociate, however he also monitors his breathing and technique closely. As a result this individual reports feeling calm when exercising. Ian likes to have a challenging goal during exercise and finds pleasure in hard work and exercise effort.

Irene

Irene is a committed exerciser whose exercise behaviours form part of an active life which she believes is important. She has a very balanced approach to exercise. Her main goals are based around improving or maintaining her health via cardiovascular and resistance exercise and also advancing her health with Pilates, which also is enjoyed as a chance to develop new skills. Irene also recognises briefly that vanity is a part of being slim, but this was not an important goal. This participant performs gym exercise on her own but is keen to socialise with others when not working out as part of the exercise experience (when changing post-exercise). Irene reports that her long-term exercise commitment has made the exercise process fairly habitual and automatic. She monitors her goals somewhat using health markers such as blood pressure and other physical measurements and also feedback from bodily sensations, the habitual nature of exercise seems to reduce the requirement of continual feedback from goal monitoring. She reports a long-term view of health and skill goals and that there is always something to work on (i.e., in Pilates). This participant gets a sense of achievement from the way in which her exercise positively impacts activities of daily living such as walking up a hill.

Isaac

Isaac exercises to improve and maintain his health. Exercise is part of a healthy lifestyle that this individual feels is important, and taking cardiovascular exercise is seen a way of being healthy while having a sedentary job. Exercise has always formed an important part of Isaac's life in order to maintain good health and also to advance his exercise capabilities (yoga / martial arts based). Isaac fits exercise in around a busy work and family life and will try to perform exercise even if out of normal routine (i.e., when away on business). Isaac enjoys exercising hard and follows a routine that he sets; partially based on exercises he sees others doing that he incorporates into his workout. Following exercise this participant reports feeling energised and psychologically confident and this seems to transfer to his work life. Isaac monitors his exercise by his waist circumference as a way of telling if energy intake and expenditure are balanced and pays attention to heart rate, cholesterol and other health markers. During exercise he uses the distance on cardiovascular machines as a guide to progress. Achieving exercise goals equates to feelings of discipline which he transfers to his work life and on achievement he advances the challenge. Isaac also valued a good appearance which was evaluated in

terms of the comments that people gave him, which seemed to be an integral part of his lifestyle (as an afro-Caribbean male). He did not talk about exercise and appearance however as exercise was more focused on health and maintaining appearance was a by-product.

Emma

Emma exercises mainly to improve her appearance by losing weight; although she refers to the utility of activities of daily living in terms of health and functionality in the future (she would not exercise if she was “naturally thin”). Emma has exercised sporadically for the past 7 years with large breaks where barriers to exercise interfered. Emma’s gym routine is prescribed by the gym staff and exercise for her is not a social occasion. Exercise means looking fit and healthy to Emma, she prefers weights to cardiovascular exercise as weight are easy, and have a more immediate effect in terms of changing body shape. Appearance goals are driven in this case by the perceived concomitant increase in confidence and also her self-presentation to others and society. Interestingly she wants to self-present as healthy and believes that this is judged via appearance by society. On goal attainment this participant will try to maintain for fear of returning to “what she was before.”

Ellen

Ellen exercises primarily for two extrinsic goals; to maintain/enhance her appearance and to be recognised as an exerciser by others. These both are based in self-presentational concerns and also a desire for attention from others which she suggests originates from “insecurities about things”. While Ellen largely exercises on her own, going to the gym is a highly social activity as she is known by many members and staff, although it is unclear whether the socialising is purposeful or incidental. Ellen suggested that she would not exercise for health reasons or to improve skills. While her extrinsic goals are very strong, this participant reported a fairly low degree of effort imparted during exercise and reported a preference for “easy” exercise. She displays clear internalisation of societal body image ideals and often makes image based comparisons of others in the gym. Ellen measures her goals by the way she looks and largely by the attention / comments about her appearance or her identity as an exerciser from others which are actively sought (i.e., by wearing physique-revealing clothes during exercise). This self-presentation had a dark side however; as Ellen seeks solitary exercise away from others if she feels that she does not look good and would avoid exercising next to a female who was more attractive than her for fear of being seen as second best by others. Paradoxically this individual feels that exercise is the time that she looks her best which provides positive feelings.

Eric

Eric’s primary exercise goal is to “bulk up” which is related to attaining a muscular appearance. Strength gained as a by-product is viewed positively as strength for football games. Eric also refers to appearance-related weight management and avoidance of weight gain in the form of fat. He wants to look good and be attractive to females. Eric is dissatisfied with his current physique and is “smaller” than he desires and like others, equates looking good and feeling good, in that he thinks that being bigger gives confidence. Eric prefers exercising by working on specific “visible” muscles groups and because weights are easier than

cardiovascular exercise. Eric feels that he wants to self-present as a fit person with an “acceptable appearance.” A further goal of exercise is social recognition; Eric seeks to gain the appearance of professional footballers and exercises in part to be seen to fit into this role (although he plays football at a recreational level). He wears certain clothing to exercise in to be recognised for a footballer identity and also to appear attractive to others suggesting that he feels that he is judged on the basis of his appearance in the gym. Eric feels attractive in the gym setting which gives him confidence however he reports feeling uncomfortable when recognised or watched in the gym if he is not lifting heavily for fear of negative evaluation of his competence. Eric exercises alone and suggests that this is because he is self-driven and doesn’t need anyone to motivate him. He monitors his exercise looking at his body fat percentage and his appearance in the mirror, particularly visible body parts and by the comments of other people. Eric has a fear of negative comments regarding his appearance. When talking of achievement he spoke of celebrity / professional sports people, suggesting perhaps that his standards are set very high and that he has internalised somewhat the cultural thin-ideal. When he achieves his goal he talked of an anticipated pressure to maintain the hard work that he had put in.

Eve

Eve’s primary exercise goal is to change her appearance by losing weight, however due to a medical condition exacerbated by being overweight she suggests that the associated health benefits are a positive by-product. Eve commenced exercise following pressure from her father who told her to lose weight. She reports wanting to do this herself but admits not having the “will power” or “motivation” until pushed by her father. Now her exercise is underway Eve reports attending the gym on her own, seven days a week, however experiences occasional lapses in motivation. Eve reports gaining a great sense of confidence from losing weight and reports a sense of self-acceptance as a result. Eve’s exercise preferences are focused around (a) what will burn the most calories (b) what will change the appearance of visible body parts. As a result she prefers to do weights and toning exercise because they are easier and will confer faster results in terms of body shape change. Eve is highly aware of societal ideals of body size and appearance and suggests being a size 18 previously was “horrendous” and that having slimmer arms is “just nicer” when presenting herself to others. Eve focuses closely on burning a specific number of calories while exercising which she admits is discouraging and often gives up as a result of watching this calorie count. Eve monitors her exercise by her weight and her appearance in the mirror and also by the comments of others regarding her appearance. When she reaches her goal she suggests there will be a pressure to maintain the hard work she has put in. When seeing objective weight loss this participant immediately checks in the mirror to see if her subjective appearance has changed, however she reports that mirror based evaluations have both positive and negative outcomes.

Edward

Edward’s primary exercise goals were related to appearance improvement and social recognition; these objectives were inter-related for this participant in that having a better bodily appearance confers more attention from the opposite sex and increases peer acceptance. Edward also reported fitness goals but spoke little of these in the interview. He believes being attractive gains respect from others and is motivated by others comments about his appearance if they are either positive or negative. His fitness goals are monitored internally by assessment of football fitness

at weekends, and appearance goals were monitored by the fit of clothes, evaluation of the appearance of undesired body parts in mirrors and comments from other people. At the gym this participant prefers cardiovascular exercise, as upward appearance based comparisons to other males lifting weights is intimidating and promotes feelings of inadequacy. He seeks to avoid “looking like an idiot” by not lifting weights. Edward feels that he is making progress towards his appearance goal as he referred to seeing weight loss and body appearance change and receiving comments from others which relate to his social recognition goals. Edward feels that he is fitter as he can feel this in sport settings.

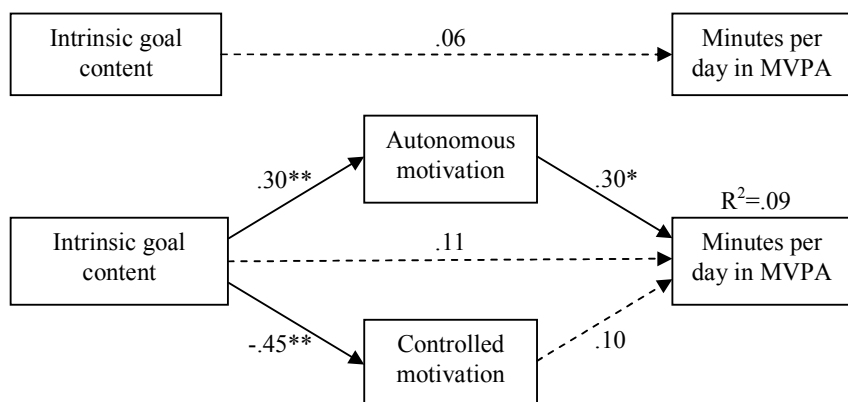
Appendix 6

Supplementary data from Study 4 (Chapter 6)

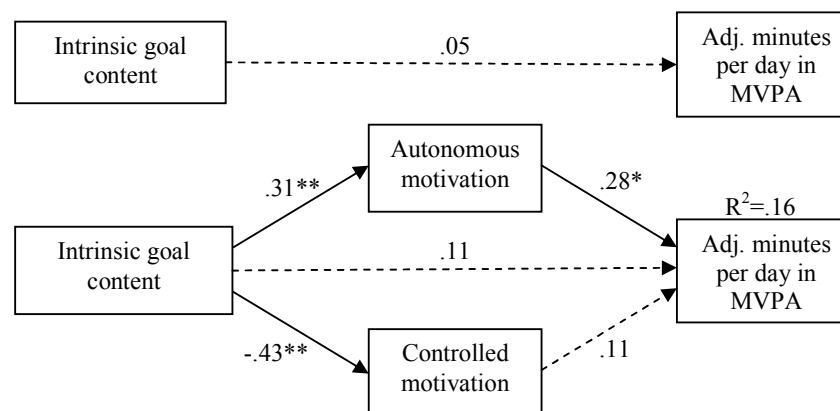
6.1 Supplementary Mediation Analysis using Intrinsic Goal Content

6.1 Supplementary Results of Mediation Analysis Conducted in Study 4 (Chapter 6) using Intrinsic Goal Content

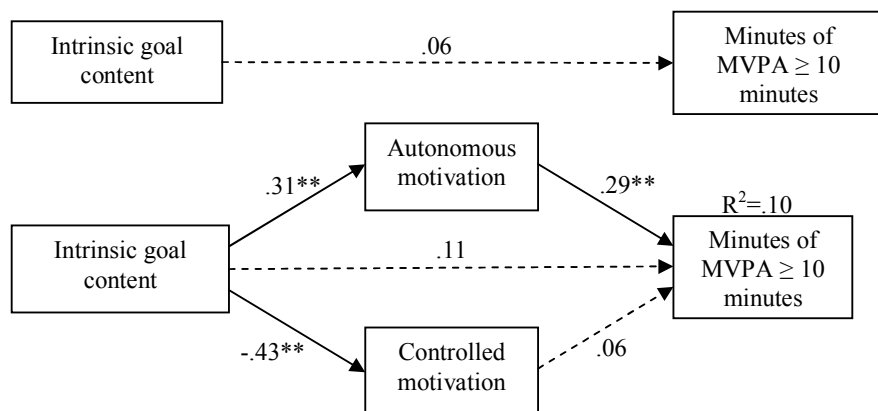
Multiple mediation models showing effects of intrinsic goal content on indices of exercise behaviour via behavioural regulation



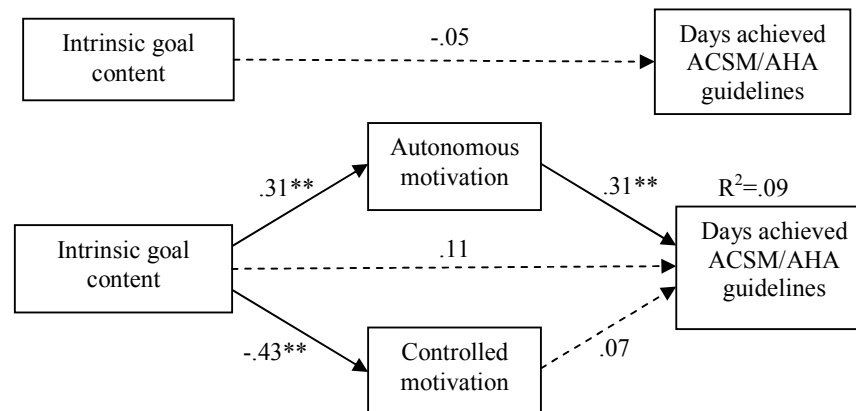
Model A: Average time per day in MVPA



Model B: Adjusted average time per day in MVPA



Model C: Total time in MVPA in bouts ≥ 10 minutes



Model D: Number of days achieved ACSM/AHA guidelines

Note. Values are standardised estimates controlling for age, gender and BMI/WC. *b* paths are estimated controlling for the other mediator. Dashed lines represent non-significant estimates. * $P < .05$, ** $P < .01$

6.1 continued

Unstandardised Indirect Effects of Intrinsic Goal Content on Exercise Behaviour through Autonomous and Controlled Motivation

	Point estimate	BCa 95% confidence interval	
		Lower	Upper
Model A: Average minutes per day in MVPA			
Total indirect effect	.162	.001	-.377
Autonomous motivation (a_1b_1)	.191	.069	.386
Controlled motivation (a_2b_2)	.024	-.163	.018
Contrast (a_1b_1) vs. (a_2b_2)	.22	.086	.412
Model B: Adjusted average minutes per day in MVPA			
Total indirect effect	.165	.007	.373
Autonomous motivation (a_1b_1)	.195	.061	.393
Controlled motivation (a_2b_2)	.030	-.163	.024
Contrast (a_1b_1) vs. (a_2b_2)	.23	.072	.417
Model C: Average minutes in MVPA in bouts ≥ 10 minutes			
Total indirect effect	.229	.004	.517
Autonomous motivation (a_1b_1)	.250	.079	.523
Controlled motivation (a_2b_2)	-.021	-.185	.040
Contrast (a_1b_1) vs. (a_2b_2)	.271	.089	.523
Model D: Number of days where ACSM/AHA guidelines were achieved			
Total indirect effect	.218	-.004	.478
Autonomous motivation (a_1b_1)	.239	.074	.480
Controlled motivation (a_2b_2)	.020	-.192	.027
Contrast (a_1b_1) vs. (a_2b_2)	.259	.089	.488

Note. BCa = Bias corrected and accelerated. MVPA = moderate-to-vigorous physical activity. ACSM/AHA guidelines are for 30 minutes of MVPA accumulated in bouts of ≥ 10 minutes.